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FRANK G. THOMPSON, *Director*

NATURAL HISTORY SURVEY DIVISION  
HARLOW B. MILLS, *Chief*

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Volume 24

BULLETIN

Article 1

# The Mosquitoes of Illinois

(Diptera, Culicidae)

HERBERT H. ROSS



*Printed by Authority of the State of Illinois*

URBANA, ILLINOIS

*August 1947*

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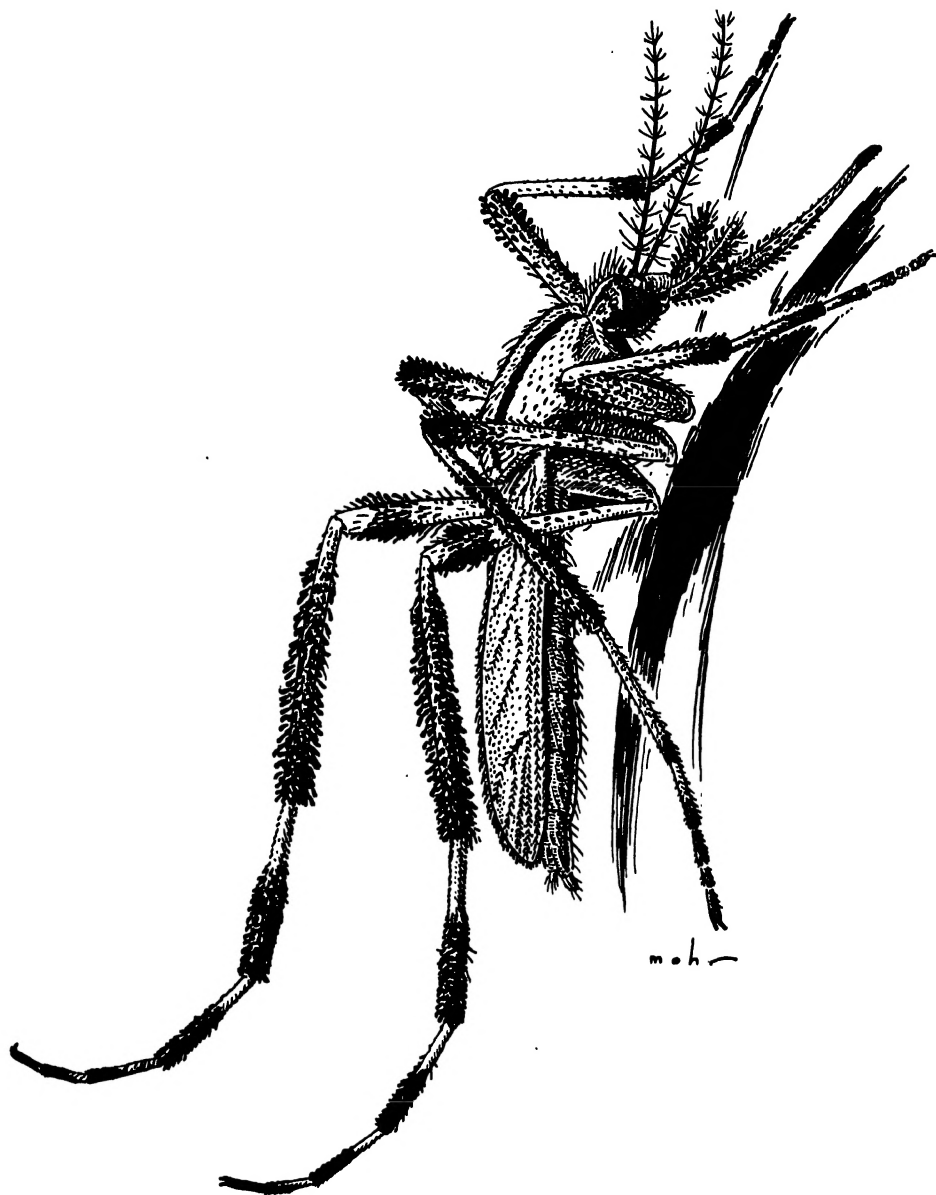
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*This paper is a contribution from the Section of Insect Survey.*

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One of the largest Illinois mosquitoes is the "gallinipper," *Psorophora ciliata*, which may attain a wingspread of 15 mm. (over half an inch). It is a vicious biter and is generally distributed over Illinois. The larvae or wigglers of this species breed in rain pools and have the habit of feeding on larvae of other mosquito species.

# The Mosquitoes of Illinois

## (Diptera, Culicidae)

HERBERT H. ROSS

**M**OSQUITOES are midgelike insects of various sizes, some of them minute, some of them nearly a half inch long. They belong to the family Culicidae, which belongs to the order Diptera, embracing the common housefly and other two-winged flies. Mosquitoes have aquatic larvae called wiggle-tails, wigglers, or wrigglers, which transform to aquatic pupae called tumblers. The adults, which emerge from the pupae, are aerial.

About 150 species of mosquitoes are known to occur in the United States and Canada, and 52 of these have been taken in Illinois. The Illinois mosquito fauna represents a combination of the northern and the southern mosquito faunas, a combination not yet treated in the various reports giving keys to the faunas of limited regions.

Mosquitoes are a real nuisance in many parts of Illinois. Although some of the more intensively farmed areas are comparatively free from all but local incursions of mosquito broods brought on by unusual weather conditions, in all other parts of the state mosquitoes are a perennial problem. An extremely vicious biter, the salt marsh mosquito, *Aedes sollicitans*, has invaded a few Illinois cities. The malaria mosquito, *Anopheles quadrimaculatus*, is a menace to human health in some areas. To be economical as well as effective and thorough, a control program for these and other mosquitoes must be based on accurate identifications of the species involved and a knowledge of their peculiarities of life history and habits.

The nation's annual "mosquito bill" is high—probably \$100,000,000 due to mosquito-borne diseases, and close to \$50,000,000 for screening, pest control programs, and depressed real estate values.

The object of this paper is to provide means for making mosquito control programs more effective, first by furnishing illustrated keys and descriptions for the identification of mosquito species that occur in Illinois and states similar in climate, and

second by summarizing information regarding the distribution, biology, and habitat preferences of the species.

### BIOLOGY

Mosquitoes, in common with other groups of flies, have four distinct stages in their life history: (1) the egg, laid by the female; (2) the larva, wiggle-tail, wiggler, or wriggler; (3) the pupa, or tumbler; and (4) the adult fly.

#### Eggs

Eggs deposited by Illinois species of mosquitoes fall into three fairly distinct categories: (1) those laid singly on water; (2) those glued together in rafts that float on water; and (3) those laid singly in damp humus or other semidry material.

**Eggs Laid Singly on Water.**—In this category belong the eggs of *Anopheles*, fig. 1C. They are elongate oval, usually pointed at one end, and have a pair of lateral floats. From 100 to 300 eggs may be laid by an adult female after taking a blood meal; usually the eggs hatch in a few days. Little is known about the eggs of the tree hole genus *Megarhinus* except that they are laid singly on the surface of water. *Anopheles* and *Megarhinus* are the only genera in this class known to occur in Illinois.

**Eggs Laid in Rafts on Water.**—The eggs of many mosquito genera are deposited side by side in such a manner as to form a raft, fig. 1A. This raft floats on the surface of water, and the eggs hatch in a few days, each larva escaping from its egg at the end that touches the water. The raft may contain a hundred eggs or more. In the genera *Culex*, *Culiseta*, *Mansonia*, and *Uranotaenia*, eggs are deposited in rafts. The larvae of all these groups breed in permanent bodies of water.

**Eggs Laid Singly in Semidry Places.**—In many genera of mosquitoes, including *Aedes*, *Psorophora*, *Orthopodomyia*, and

*Wyeomyia*, the eggs are laid out of water, but they do not hatch until water has risen and inundated them. The eggs may be laid either just above the water line in such situations as tree holes, various water containers, and marsh edges, or in damp humus in the bottoms of recently dried-up pools that are subject to periodic flooding. The eggs of *Aedes*, fig. 1B, and *Psorophora*, normally

known as *intermittent breeders*. They include all species of *Psorophora* and certain species of *Aedes*: *vexans*, *sollicitans*, *trivittatus*, and many southern species. In the other class, called *annual breeders*, because only one generation is developed each year, the eggs must be subjected to winter freezing before they develop. Eggs laid by the adults of one generation do not hatch with

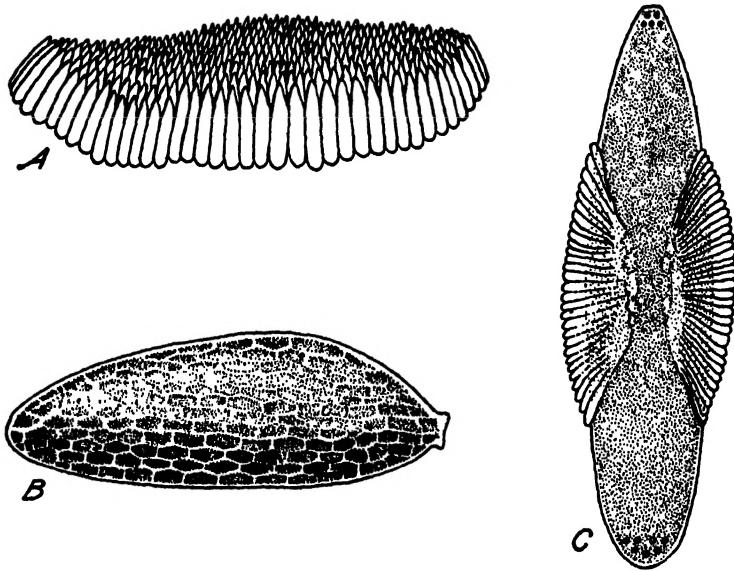


Fig. 1.—Eggs of mosquitoes: A, *Culex restuans*; B, *Aedes taeniorhynchus*; C, *Anopheles quadrimaculatus*. (After Howard, Dyar, & Knab.)

laid in damp humus, are adapted to withstand desiccation and may lie dormant 1 or 2 years without losing their viability. *Wyeomyia* lays its eggs above the water line in the pitcher plant, and these eggs do not hatch until the water within the pitcher rises. The same habit is a characteristic of the tree-hole mosquitoes, *Orthopodomyia* and *Aedes triseriatus* and *aegypti*, which lay eggs on the sides of tree holes or water containers just above the edge of the water so that with a rise in the water level the eggs hatch.

The species of *Psorophora* and *Aedes*, which lay their eggs out of the water, may be divided into classes with respect to significant differences in egg hatching. In one class the eggs hatch as soon as they are flooded; since in this species the life history is completed rapidly, several generations usually are produced in a summer as pools dry and flood with alternate dry and rainy periods. Species belonging to this class are

summer flooding but lie dormant through the winter and hatch the next spring. To this class belong many species of *Aedes*, such as *grossbecki*, *stimulans*, and *implacabilis*.

### Larvae

The mosquito larva or wriggler, fig. 2, has a distinct head, broad thorax, and tubular abdomen. It lives only in water. The larval period is one of feeding, during which the small larva hatching from the egg grows to a size large enough to produce the adult fly. Unlike the adult, this larva has no beak and does not suck food; instead it has a series of brushlike rakes in addition to the grinding and grasping mouthparts, a combination enabling it to strain, scoop, and ingest small aquatic organisms and particles of plant or animal matter floating in or upon the water or resting on the bottom. In the

few genera in which the larvae are predaceous on other mosquito larvae, the mouth-parts are sharp-toothed for grasping and swallowing the prey.

Unlike fish, the wriggler does not obtain oxygen from the water by means of gills. When in need of air, the larva in most species swims upward until it is just below the surface of the water, if it is not already there, and sticks the breathing apparatus (in some species a tube and in others a plate), which is near the end of the abdomen, through the surface tension membrane into actual contact with the air, fig. 2. With the larva in this position, the air inside the body is exchanged for fresh air above the water. Among Illinois mosquitoes, only the larva of *Mansonia* does not come to the surface for air. In this species, fig. 18, the air tube forms a sharp, piercing organ, which is thrust into the air chambers in the underwater portions of marsh plants such as the cattail. The larva of *Mansonia* obtains its oxygen entirely from this source.

The larvae of Illinois mosquitoes may be divided into two distinct types on the basis of breathing structures and feeding habits, the anopheline type and the culicine type. In the anopheline type (including only the genus *Anopheles*), the larvae normally rest parallel to the surface, touching the surface tension membrane, fig. 2A. They have no air tubes; the spiracles form a flat structure on the back of segment 8. The larvae normally twist their heads through a 180-degree angle and feed on microorganisms or other particles at or on the surface, but occasionally feed below the surface much as do culicine larvae. When disturbed they swim to the bottom and hide. In the culicine type, the larvae normally feed on or near the bottom and come to the surface only periodically for air. This group includes all of the Illinois mosquitoes except *Anopheles*, and all of them have distinct air tubes. The predaceous species, such as *Psorophora ciliata*, do not feed on bottom microorganisms but usually cruise near the bottom and grasp their prey

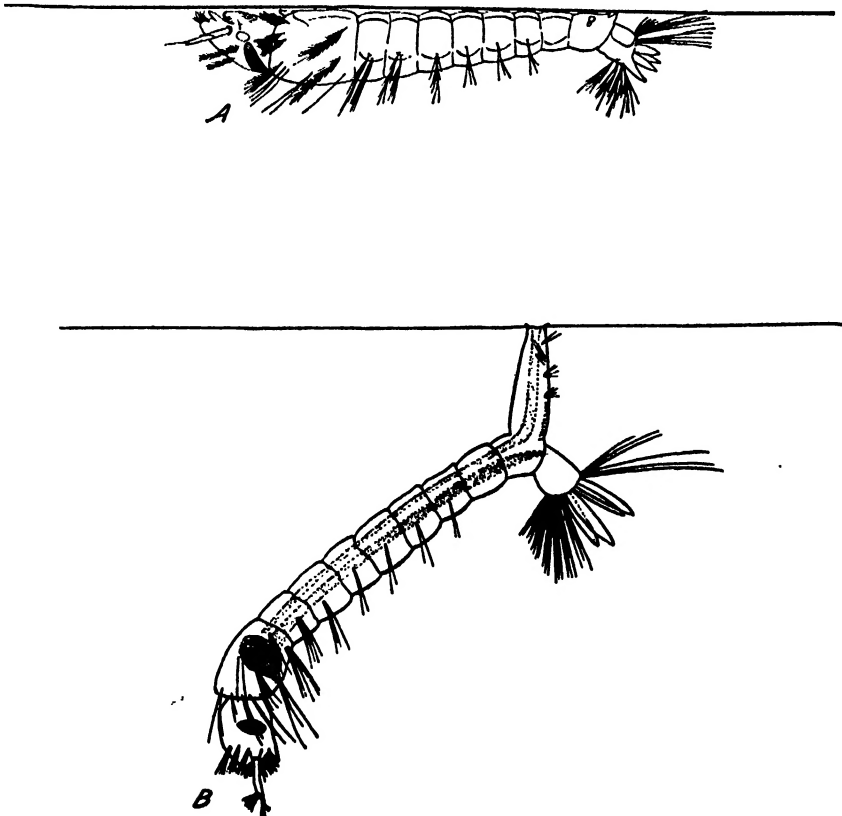


Fig. 2.—Larvae of mosquitoes: A, *Anopheles*; B, *Culex*. (After King, Bradley, & McNeel.)



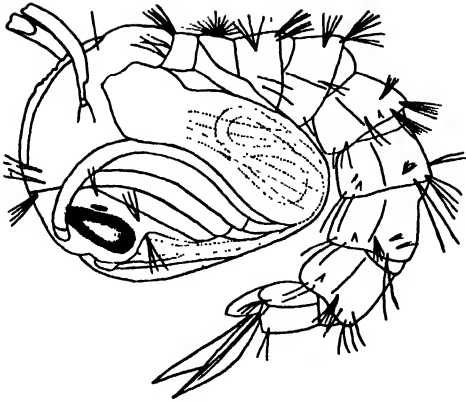


Fig. 3.—Pupa of mosquito. (After King, Bradley, & McNeel.)

there. The curious genus *Mansonia* is also included in this group although, as mentioned above, it does not come to the surface for air. It is a true bottom feeder.

#### Pupae

The pupae do not feed but they breathe in the same manner as the larvae; the air tube is situated on the thorax, fig. 3, instead of near the end of the abdomen as in the larvae. The pupal stage, in which the muscular and other body structures of the larva

are broken down and reorganized into the structures of the adult, generally lasts only a few days. At the end of that time the mature pupa comes to the surface of the water, and the adult within it breaks the pupal skin, crawls out onto the surface of the water, and flies away.

#### Adults

Mosquito adults, fig. 4, are fairly small, delicate, winged flies, quite slender, and always with long, spindly legs. All the adults of the true mosquitoes have beaks. The visible part of the beak is a scabbard or sheath in which a group of extremely fine stylets makes up a needle-like piercing and sucking organ; it is the function of the sheath to keep this slender needle straight when it is thrust through the skin of the animal upon which the female mosquito feeds. Both males and females fly with a distinct humming or buzzing sound.

Only the female mosquito "bites," or feeds upon animals; the male feeds on nectar and water. Whereas the female seeks out her prey and may travel long distances to it, the male is relatively inactive, generally hiding in grass or shrubbery except during the mating flights. There is evidence that the female does not bite for several

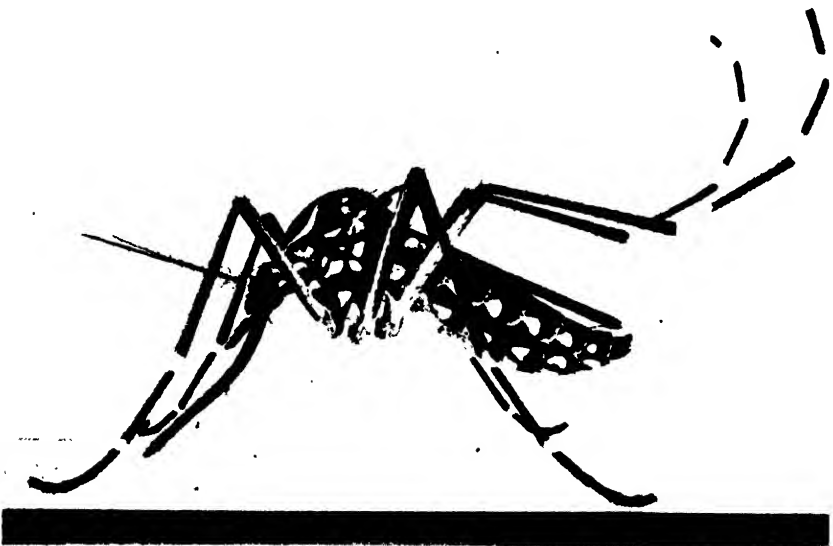


Fig. 4.—Adult of *Aedes aegypti*. (From photograph, loaned by the U. S. Public Health Service, of model in the American Museum of Natural History.)

days after she becomes an adult. Not all species bite humans. Some feed on nectar, and it is thought that a few others feed chiefly either on plant juices or the blood of birds and small mammals.

Females of most species seek their blood meal during the dusk and night periods. Many of these same mosquitoes attack readily in the late afternoon or on cloudy days and during the dawn period. The woodland species almost invariably bite throughout the day, although their attacks are usually most vicious during the crepuscular period. A few species attack readily in the open during the day time. Probably the best known Illinois species having this habit is *Anopheles walkeri*. Of unusual interest is the biting habit of *Psorophora cyaneescens*, which attacks in the open and during times of bright sunlight.

Flight habits of mosquitoes have been the subject of considerable study, in which marked or colored specimens have been released and their recovery in light traps or resting places has been plotted. A species of mosquito apparently will behave differently under different conditions. It is usually considered that malaria mosquitoes normally have a flight range of not more than 1 or 2 miles. Probably the longest flight ranges occur in species of *Aedes*. It is not unusual for summer swarms of *Aedes vexans* to migrate 2 or 3 miles and possibly up to 15 miles, and the salt water mosquito, *Aedes sollicitans*, has been known to migrate 40 or 50 miles. Many woodland species appear to be fairly restricted in their movements and seldom leave the piece of woods in which they have matured.

The length of life of adult mosquitoes is not well known. Some of the *Anopheles* and *Aedes* females undoubtedly live 1 or 2 months during the summer period. The adults that hibernate have a much longer life span.

### Hibernation

The great majority of Illinois mosquitoes, including most of the species of *Aedes* and *Psorophora*, hibernate in the egg stage. A few species, such as *Wyeomyia smithii*, *Anopheles barberi*, and species of *Orthopodomyia*, hibernate as larvae frozen in pitcher plants or tree holes in which they breed. *Anopheles*, *Culex*, and at least *inornata* of *Culiseta* overwinter as fertilized females.

The males die with the advent of cold weather. The females hide in hollow trees, cellars, manholes, and other sheltered places, from which they emerge in spring and lay eggs.

### Habitat Preferences

The various species of mosquitoes differ greatly in the type of habitat frequented by the larvae. Some species breed in a great variety of situations, whereas others are extremely restricted in their breeding places. The following summary outlines in a general way the habitats preferred by the Illinois species.

**Running Water.**—*Anopheles punctipennis* usually breeds in small streams, frequenting the edges and shallow areas where the current is sluggish. This species breeds with equal success in still water. A few species of *Culex* sometimes breed in moving water heavily laden with organic matter where the current is slow. These same species normally breed in still water.

**Still Water.**—All Illinois species will breed in still water, and most of them only in still water, chiefly small ponds and pools of many types, the shallow edges of lakes, and the still water in shallow, dense weed beds along the edges of streams. Still water habitats are of several types and may be classified as permanent, temporary, specialized, and semidomestic areas.

**PERMANENT AREAS.**—All species that lay eggs on the surface of the water, whether singly or in rafts, frequent permanent water areas. All prefer areas with shallow water and little wave action, abundant cover in the form of at least moderate aquatic vegetation, and abundant food in the form of humus or other organic matter on the bottom and floating particles or microorganisms at the surface. Marshes, fig. 5, or shallow ponds with cattails, sedges, and associated aquatic vegetation are ideal for many mosquito species.

**TEMPORARY AREAS.**—In this category are ponds that fill with water intermittently for variable periods. In all these ponds one of the chief requirements for a good mosquito habitat is that they have ample organic matter (usually in the form of rotting leaves) on the bottom.

In Illinois, temporary ponds are extremely varied with respect to how and when they are filled, where they are situated, and how



Fig. 5.—Marsh near Hinsdale, Illinois. In spring the more abundant mosquitoes at the marsh edge include *Culiseta inornata*, *Aedes fitchii*, *Aedes vexans*, and *Culex apicalis*.

long they last. Most of them fall into one of four classifications: winter seepage ponds, flood plain ponds, summer rain ponds, and marsh edges.

Winter seepage ponds fill up during the winter or early spring with surface or seepage water from winter precipitation or the spring thaw. Ponds of this type, fig. 6, may have water in them for several months, but during much of this time the weather is too cold to allow mosquito development. They support many of our most vicious early spring *Aedes*, especially *canadensis*, *stimu-*

*lans*, *grossbecki*, and *implacabilis*. The same species occur in flooded stump holes, fig. 7.

Flood plain ponds form with the overflow and retreat of streams that leave isolated pools of water scattered throughout the flood plain. These are favorite places for many *Aedes*, especially the early spring species *sticticus*, and some *Psorophora* species.

Summer rain ponds form in many depressions during heavy summer rains and remain for periods of a few days or weeks. In these breed *Aedes vexans* and many species of *Psorophora*



Fig. 6.—Woodland pool, Bensenville, Illinois. This spring pool contains an enormous population of *Aedes stimulans*. It dries up in summer.



Fig. 7.—Stump hole, Bensenville. A favorite habitat of *Aedes canadensis*.

Marsh edges that are alternately flooded and exposed by the rise and fall of water give the same conditions as temporary ponds, as far as mosquitoes are concerned. These marsh edges or margins, fig. 5, are important mosquito breeding grounds, especially for *Aedes vexans*.

**SPECIALIZED HABITATS.**—Two situations of unique interest from the standpoint of the mosquito fauna are tree holes and pitcher plants. Each of these may harbor species of mosquitoes found in no other situation. Tree holes, fig. 8, include cavities within standing tree trunks and inside fallen trees (Jenkins & Carpenter 1946).

Illinois mosquitoes that are restricted to this habitat include *Megarhinus septentrionalis*, species of *Orthopodomyia*, *Anopheles barberi*, and *Aedes triseriatus*. The tree holes fill up either with rain water or with sap that has risen within the wounded tissues. Larvae that live in the tree holes develop much more slowly than is usual for species living in ponds. Only one Illinois species of mosquito, *Wyeomyia smithii*, breeds in pitcher plants; it is found in no other situation. Its larva feeds on decomposing animal material trapped in the pitcher.

**SEMI-DOMESTIC SITUATIONS.**—Several species of mosquitoes breed readily in situations around human habitations. They breed in the water that accumulates in fish ponds, tin cans, or almost any other type of container, fig. 9. They may frequent also the accumulation in stopped-up eaves troughs, drains,

and cisterns. In Illinois the chief species found in these situations are *Culex restuans*, *pipiens*, and *quinquefasciatus*. In contain-



Fig. 8.—Tree hole at Starved Rock State Park. This is the habitat for *Aedes triseriatus*, *Orthopodomyia* species, and *Anopheles barberi*.



Fig. 9.—Refuse heap near Wilmette, Illinois. Water in the containers is a favorite breeding place for *Culex pipiens* and *restuans*.

ers that are out of doors and that have in them an abundance of organic material (neglected fish ponds are the favorites), *Anopheles punctipennis* may breed in enormous numbers. *Aedes aegypti* also breeds in similar containers, usually those inside buildings.

### SEASONAL DISTRIBUTION

The various mosquito species appear in a fairly definite sequence as the season advances. The earliest species are *Aedes*, whose larvae develop in the spring pools. In southern Illinois the principal species are *canadensis*, *grossbecki*, and *sticticus*, through the central part of the state *canadensis* and *sticticus*, and in the northeastern part *stimulans*, *implacabilis*, *fitchii*, and others. In southern Illinois the first emergence may occur as early as April 1, in northern Illinois by the middle of May, but usually first emergence is about two weeks later than these dates. The early *Aedes* listed above are without exception annual breeders. They are followed in rapid succession by *Culiseta inornata* and *Culex apicalis*. A week or so after these appear, the large number of summer species begin to make their appearance. These include *Anopheles*, several species of *Culex*, and usually *Aedes vexans* and *trivittatus*. The summer species continue to breed in suitable locations throughout the summer or intermittently with the summer rains.

A third group of species, which includes *Culex quinquefasciatus* and *Uranotaenia sapphirina*, may be present early in the season, but an appreciable population of this group usually does not appear until at least midsummer.

When the spring weather is uniformly cold well into May, and then is followed by a series of warm weeks, early and midseason species come out together, and there is little demarcation apparent between seasonal groups.

### DISTRIBUTION PATTERN

The mosquito fauna of Illinois resolves itself into three well-marked groups: (1) species of wide distribution, which are generally distributed in Illinois; (2) northern species that have a range widespread to the north, and that occur in only the northern portion of the state; and (3) southern species that have a range extending only slightly into Illinois and that are only sporadic north of the southern third of the state.

The species that are generally distributed include some of our most abundant nuisance species, such as *Aedes vexans*, *trivittatus*, *canadensis*, and *sticticus*, *Psorophora ciliata* and *ferox*, *Culex pipiens*, *apicalis*, and *restuans*, and *Culiseta inornata*.

Northern species whose range extends into northern Illinois include many of the annual-breeding large *Aedes* found in the glacial bogs and marshes in the extreme northeastern corner of the state. These species are *Aedes implacabilis*, *punctor*, *stimulans*, *excrucians*, *fitchii*, *flavescens*, and *cinereus*. A few of these, such as *flavescens* and *punctor*, are rarities; *excrucians* is present in only moderate numbers; the other species breed tremendous populations. Other mosquitoes in this northern group include *Culiseta morsitans*, confined to the tamarack bogs, and *Wyeomyia smithii*, the pitcher plant mosquito, which also occurs only in tamarack bogs. On the basis of Illinois collecting, *Anopheles walkeri* appears to be in the same group, since in this state it is abundant only in the cattail marshes and bogs of the northern part; records from other states indicate, however, that its range extends far to the south where marshes are available. Another northern mosquito taken in Illinois is *Aedes spencerii*, for which our only record came from the northwestern corner of the state.

Many southern species have been taken in the extreme southern tip of Illinois, most of them in the woodland pools of the post oak flats in the Mississippi River valley. The post oak flats list includes *Aedes fulvus*

*pallens*, *dupreii*, and *grossbecki*, *Psorophora howardii*, and *Anopheles crucians*. *Aedes thibaulti* has been taken near Carbondale, only 50 miles north of Cairo at the southern tip of Illinois. *Psorophora discolor*, *varipes*, and *cyaneus*, and *Megarthinus septentrionalis* are southern species which often occur in the southern eighth or fourth of Illinois and sometimes sparingly north of that.

*Aedes aegypti* is another southern mosquito that has been taken in the St. Louis area and southward. Apparently it is unable to maintain itself there and occurs only as a temporary adventive during favorable years.

The southern house mosquito, *Culex quinquefasciatus*, which has been taken in some numbers in southern Illinois, occasionally extends northward at least as far as Urbana. Present collection data are far from conclusive but suggest that unfavorable winters push back the range of this species and that it migrates northward again during a succession of favorable years.

Perhaps our most unusual record is that for *Aedes aurifer*, a northern and eastern mosquito for which we have only one Illinois record, from the extreme southern tip of the state. Almost as unusual is the occurrence of the northern *Aedes cinereus* in the same locality. Presence of these northern species in southern Illinois illustrates a tendency, which has been noticed in several other insect groups, for occasional northern species to occur in or near the Mississippi River region south of the main body of their range.

### ECONOMIC IMPORTANCE

Mosquitoes cause an economic loss both as nuisances and as disease carriers.

The nuisance category includes all those species that inflict painful bites but that are not known to carry diseases. Most important in this group are the various species of *Aedes* and *Psorophora*; in cities and towns, species of *Culex* are of prime importance. Mosquitoes in the nuisance group inflict financial loss in various ways. In some sections they restrict the vacation season, with subsequent loss of patronage to resort establishments. They attack domestic animals and fowls and, when in large numbers, cause loss of weight and health. It has been estimated that 500 mosquitoes will draw one-twentieth of a pint of blood per day from an exposed animal. Sometimes mosquitoes

become so abundant as to interfere with or stop work by man, with a consequent loss of labor and accomplishment. Mosquitoes are among the worst nuisances of the out-of-doors and prevent enjoyment of recreational facilities by many people seeking exercise and relaxation.

Disease-transmitting mosquitoes are the sole vectors of malaria in human beings. Malaria is an endemic disease in southern Illinois. Only 50 miles to the south of Illinois, in the Mississippi River valley, occurs one of the high density areas of this disease in eastern North America. *Anopheles quadrimaculatus* is considered the only important mosquito species capable of transmitting the disease in Illinois.

Several other human diseases, such as yellow fever, filariasis, and dengue, are transmitted by certain species of mosquitoes that occur in Illinois. However, recent outbreaks of these diseases are so far removed geographically from Illinois, or the known mosquito vectors are so rare in this state, that the diseases are not considered a serious threat to Illinois citizens at the present time.

Public health workers have pointed out that a number of the service men returning from areas in the Pacific and Oriental regions where many insect-borne diseases occur will have been infected with these diseases. It is entirely possible that, upon returning home, the men may be a source from which mosquitoes may become infected with some of the tropical diseases and transmit them to other persons resident in the same locality. There is little possibility of knowing when and where such situations will arise. At the present time this problem seems to resolve itself into one of early detection and accurate diagnosis of the diseases by local medical authorities.

Up to the present time measures instituted against mosquitoes in Illinois have been directed toward abatement of nuisance species or toward control of the malaria vector, *Anopheles quadrimaculatus*.

### CONTROL CONSIDERATIONS

Control measures require consideration as individual problems in each community or locality. In different localities different species of mosquitoes are encountered, bringing into the control problem the treatment of different habitats, and involving differences in number and seasonal timing of

mosquito generations. Vagaries of precipitation or flooding frequently require rapid and unexpected changes in control plans.

Control measures, to be both economical and thorough, must be based on data obtained by a collecting and identification program. It is wasteful to attempt control measures of every water surface within an area, because many bodies of water (and frequently the most extensive ones) do not serve as breeding places for mosquitoes. Before actual control measures are planned, therefore, larval collections should be made that will serve as a guide to the areas to be treated.

To check the efficiency of control operations, it is necessary to supplement larval collections with biting records and adult collections throughout the season. These should include light trap collections and collections from resting stations.

The persistence of adult mosquitoes in a control area (shown by collections and biting records) may indicate that breeding places within the area have been overlooked or that mosquitoes are coming in from surrounding territory. After overlooked sites have been eliminated, collection and identification of larvae from breeding places in surrounding territory will indicate additional places which should also be treated.

When adult mosquitoes are identified as to species, facts about them, fundamental in controlling them, can readily be ascertained: (a) the types of situations in which larvae should be sought and (b) breeding habits, that is, whether the mosquitoes are annual, intermittent, or persistent breeders. Such information is useful in searching out places where control treatments must be applied and determining whether the treatments need to be applied only once a year for annual breeders, following rains or floods for intermittent breeders, or at regular intervals for persistent breeders.

### COLLECTING AND PRESERVING

Mosquitoes, both adults and larvae, are so delicate that their hairs and scales, upon which identification is based, are readily broken or rubbed off by careless handling. For this reason it is necessary to use great care in the procurement of material and in its subsequent handling and preparation for study.

### Larvae

A white enameled dipper, about 6 inches in diameter, is the most convenient utensil for collecting mosquito larvae. It may be used to dip up larvae from ponds and open water. The larvae can be removed from the dipper by one of two methods: (1) by pulling them into a wide-mouth medicine dropper and then discharging them into a vial of preservative or into a rearing capsule or (2) by pouring the contents of the dipper slowly onto a cloth strainer, picking the larvae off the cloth with forceps, and transferring them to a preservative or to a rearing vial. Hairs of the larvae are easily knocked off or the larvae mutilated in other ways if the transfer is made carelessly.

Alcohol makes a satisfactory preservative; 80 per cent alcohol is strong enough if the larvae are transferred to it with forceps. If a medicine dropper is used to transfer the larvae, a few drops of water will be discharged into the preservative with each larva, and a stronger solution of alcohol should be used. Not more than two live larvae should be placed at the same time in a single vial. If many thrash around in the vial, they knock the hairs off each other. As many as 10 larvae may be put in a three-dram vial, but they should be put in one at a time; the second and succeeding larvae should not be put in until the first and others have died. The most satisfactory way to kill a larva desired for a specimen is to place it in a separate killing vial and transfer it to a stock vial after it has died.

If larvae are handled in a vial only partially filled with preservative, they will jounce around, with a consequent loss of hairs and tufts. If the specimens are in a vial that is filled with preservative, without a single air bubble in it, they will move only slowly, no matter how violently the vial is agitated, and suffer no damage.

To preserve larvae in this way, the following procedure is recommended. Put the dead larvae in a small shell vial; put this vial, open end up, in a larger vial containing alcohol above the top of the shell vial. Now pick up a plug of cotton with a pair of forceps, soak the cotton with alcohol, and plug the open end of the shell vial with the cotton under the alcohol. Then take the shell vial out of the larger vial, put it in again plugged end down, and stopper the large vial, fig. 10A.

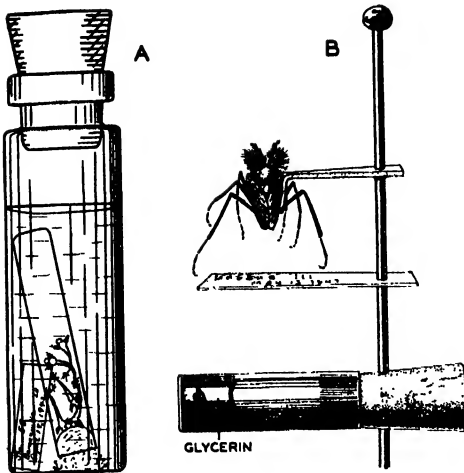


Fig. 10.—*A*, vial with inner vial containing mosquito larvae. *B*, mosquito mounted on crimped point and genitalia in microvial with pin through cork.

The plug is prepared by rolling a small piece of cotton between the fingers until it is fairly hard; after a little practice, a plug can be gauged that will fit the shell vial tightly but that is not so large that the vial will be broken when the plug is forced in. For storage, the larger vial should be kept well filled with alcohol; no evaporation will occur from the inner vial until the alcohol in the outer one is almost gone.

### Adults

There are three principal methods of collecting adult specimens: (1) by placing a killing tube over them as they sit in natural resting places or as they alight to bite, (2) by sweeping them from vegetation around their breeding places or sweeping them in the air as they swarm in mating flights, and (3) by attracting them to light traps.

**Killing Tube.**—Collecting adults with a killing tube calls for the same careful individual attention as does collecting larvae. Scales of the adults rub off very easily. For this reason, a tube with a strong killing agent should be used and only one live mosquito should be placed in a tube at one time, never more than 6 to 10 dead ones. It is wise to carry several boxes with loose, rumpled cellucotton in the bottom and to transfer to these each dead mosquito from a killing tube. These boxes, which should have tight-fitting lids to prevent accumulation of dust on the specimens, should be so placed some-

where in the vehicle used for transport that they will not tip.

**Sweeping.**—Sweeping around vegetation does not net good study specimens of females, but it is valuable in collecting males. Frequently the males are present around a pond after all the immature stages in it have matured. Collections of males often give an accurate clue as to the species that develop in the pond, and their proportionate populations. The type of sampling done by sweeping vegetation is especially valuable in scouting temporary pools. A standard sweep net can be used, and the males picked out of the net with an aspirator. If the collector desires to obtain, by using a net, female mosquitoes that are in good condition, it is advisable that the net bag be made of very fine, light material. For routine collections of males, it is more practical to use a heavy bag that will withstand the abuse involved in hitting shrubs, thick herbage, and the like.

**Light Traps.**—A standard light trap used

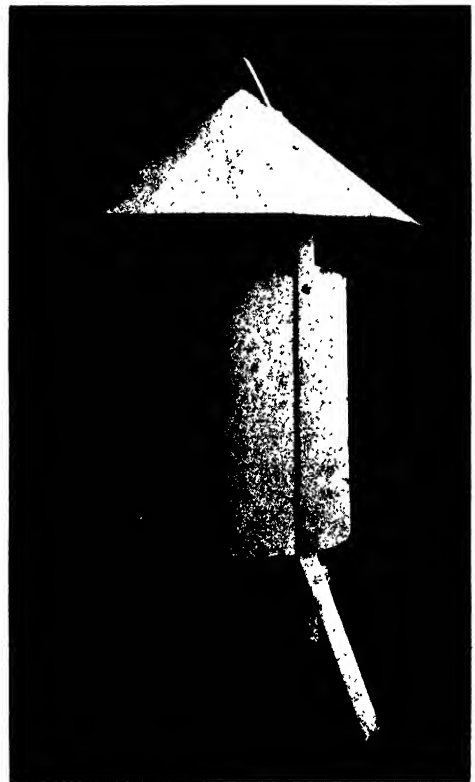


Fig. 11.—Light trap. (Photograph by courtesy of Bureau of Entomology and Plant Quarantine, U.S.D.A.)



for mosquitoes at the present time is the New Jersey light trap, fig. 11. This attracts mosquitoes by means of a low wattage electric light bulb and is provided with a fan that blows them into a killing jar. The light bulb and fan are fastened to the inside of a large cover, which sheds rain, and a funnel is below the fan, fastened to three legs that support the trap when it is placed on the ground. The standard trap has a handle on the top, so that in the field it may be hung in a tree or from some other support. Mosquito specimens collected in this type of trap are usually in fairly good condition. Occasionally a swarm of beetles will be attracted to the light and blown into the killing jar. The beetles will crawl and thrash through the collection and mangle the mosquitoes.

Individual catches from each trap should be placed, while still pliable, between layers of cellucotton in pill boxes. These layers should be thick enough to dry the insects thoroughly; otherwise mold may engulf the collection and render it useless for study. At the top of the pill box enough extra cotton should be added so that, when the lid is put on, the contents will be held firmly, but not so tightly as to crush the specimens. The container may then be transported without injury to the contents. A collection of pill boxes having different diameters and cardboard boxes 2 by 3 inches to 3 by 5 inches gives a good selection for handling catches of various sizes. These containers should be packed with cotton in a larger box if shipped by mail.

### Labeling

No matter what type of collection is made, each container, whether box, tube, or vial, should be labeled with station number, locality, date of collection, and name of collector. If the collection is of adults, note should be made of whether each container represents a biting record, a catch in a resting station, a light trap catch, or a sweeping record.

### STUDY TECHNIQUES

When the mosquito material, either larval or adult, is brought to the laboratory for study, the same care must be exercised in its further preparation as was expended in its collection.

### Larvae

In most instances it is satisfactory to preserve larval material in alcohol. Diagnostic characters in most groups are seen readily on specimens in fluid.

For detailed studies of pecten and comb scales, a permanent mount is desirable. The larva should be dehydrated by being run through the alcohols to 95 per cent, cleared in benzol or cedar oil, and then mounted in Damar balsam. Each larva with an air tube should be cut through the seventh abdominal segment and the anterior portion mounted with the dorsum up and the posterior end with the left side up. This mounting will allow the study of the largest number of characters to best advantage. Pieces of broken slides should be placed around the specimen in such a way that they prevent the cover slip from flattening and distorting the specimen. When the air tube is flattened, its proportionate length to width becomes greatly distorted and cannot then be used as an accurate guide for identification.

### Adults

Material brought in from the field should be mounted for study. A very satisfactory method of mounting is to glue the insects on card points. If the end of the point is crimped down quite a distance, and moderately thin cellulose cement is used for glue, a neat mount can be made with the dorsum of the specimen uppermost. Before being pinned, adult specimens should be relaxed for a short time. There is a tendency for the specimen to become greasy if relaxed too long, and care must be observed regarding this point. Full data labels should be put on every specimen.

Critical study of adult material frequently requires detailed examination of the genitalia. A preparation of the genitalia may be made as follows: snip or break off the posterior half of the abdomen and place it in a vial of 5 per cent caustic potash or caustic soda solution; heat the vial in a boiling water bath for about 5 minutes; remove the preparation from the caustic solution and place it in distilled water; press it gently with a needle to squeeze out dislodged viscera and brush it carefully to clean off lodged scales or dirt. Transfer the preparation to fresh, distilled water, leave it

there for 15 minutes to an hour, and then transfer it to 80 per cent alcohol that is very weakly acidulated with acetic acid. After leaving it in this solution for a few minutes, transfer it to a drop of glycerin in a well mount on a slide. The preparation is then ready for microscopic examination. For preservation, place the preparation in a very small vial, about 4 by 10 mm., which has a droplet of glycerin about 3 mm. deep in the bottom. Cork the vial and then push the pin, on which the insect is mounted, through the cork sidewise, as in fig. 10B.

In the case of heavily sclerotized genitalia, especially those of many *Aedes*, it is necessary to use a caustic solution of 10 or 15 per cent instead of 5 per cent.

For making large numbers of genital preparations simultaneously, it is convenient to use a battery of small vials of cold caustic solution. Good results with the more heavily sclerotized genitalia, such as those of *Aedes* and *Psorophora*, can be obtained with about 12 hours of clearing in cold 5 per cent caustic solution. For the more weakly sclerotized preparations, such as those of *Culex*, 5 or 6 hours of clearing are usually ample.

It is often necessary to tease apart various structures of the genitalia in order to see certain characters. For this purpose fine needles can be made from 00 insect pins. Snip off the head of the pin; then, holding the pin near the blunt end with pliers, force it bit by bit into a wooden handle whittled to suit the user. Large match sticks make fairly good handles for small needles.

## REARING

Rearing is a necessary part of the mosquito study program. There are many instances in which the larvae, or the males or females, of two species cannot be differentiated, so that for final identification it is necessary to have associated larvae and adults. Two types of rearings are useful, individual rearings and group rearings.

### Individual Rearings

A single larva is isolated in a vial or dish, about half full of water, and food is added until the larva matures. When it molts to form a pupa, its cast larval skin is immediately preserved in alcohol or mounted on a slide. At ordinary room temperatures the

pupa will mature in 3 or 4 days, and the adult will emerge. It is advisable to have some sticks or crumpled paper towel in the top of the dry part of the container so that the adult may rest there and harden for 2 or 3 days before being killed. Adults killed immediately upon emergence will shrivel. Frequently the adult can be transferred into a second container without free water and kept there for a few days to avoid the possibility of its drowning and disintegrating in the water. The pupal skin, larval skin, and adult should be preserved and mounted according to usual methods, and specimens of the same rearing associated by means of a distinctive accession number system. A convenient system is to use a lot number for each collection and a letter for each individual of this collection. For example, specimens from collection No. 157, bear the accession designations 157C, 157D, 157E, etc.; the adult bearing the label 157C is associated with a larval skin and a pupal skin also bearing the accession designation 157C. No other specimen or skin in the collection has on its label 157C. With this method, it is possible to avoid getting the skins and adults of different rearings mixed. Every skin and adult should be labeled *promptly and clearly*.

### Group Rearings

In order to secure large numbers of study specimens in good condition, group rearings are of much use. Larvae may be placed in a large tube or mason jar and fed until they transform to pupae. For small cultures of less than 20 specimens, a cap vial about 1½ inches in diameter and 2 or 3 inches long is very satisfactory. After a culture has pupated, the container should be placed in a large dry-battery jar or cage having a tight muslin top, and a liberal amount of crumpled paper toweling placed in the bottom. The small container can be fastened upright on the inside of the large container by adhesive tape. After adults begin to emerge, water can be squirted through the muslin top onto the paper toweling, care being taken not to bathe the adults. This water will prevent desiccation of the adults and their premature death. In 2 or 3 days the adults will harden satisfactorily, and the entire cage can be treated with a fumigant to kill them. They may then be picked out of the cage and mounted.

### Larval Food

If larvae are collected when almost ready to pupate, a supply of the water in which they have been breeding and some of the organic matter from the bottom of the same pond will provide ample food to carry them to full development. If, however, they are collected at an earlier stage, it is necessary to add food. The safest type of food is fresh material from the bottom of a pond; this may be added to the rearing containers every 2 or 3 days. If this food cannot be obtained conveniently, various prepared foods, such as crumbled yeast, powdered dog biscuit, moldy corn, and gold fish food can be substituted. Because there is great danger that these concentrated foods will putrefy in the water, resulting in bacterial growth that will kill the mosquito larvae, they should be used in minute quantities.

### Temperature, Aeration, and Sunlight

If the rearing is done indoors in hot weather, death of the larvae may result from too high a temperature or from insufficient aeration. Larvae that normally live in a cold water environment should be kept relatively cold. It is desirable to keep jars containing such larvae in a running water bath. This will generally keep the temperature of the rearing medium below 75 degrees F. Good ventilation is necessary for indoor rearing of *Anopheles* larvae. Satisfactory results are obtained with these larvae by using rearing containers nearly filled with water and placed near or in an open window; for adult emergence the pupae should be transferred to containers with 2 or 3 inches of air space above the water. Some exposure to sunlight gives good results, but in the heat of summer this exposure must be short to avoid overheating the water.

### CLASSIFICATION

Mosquitoes belong to the order Diptera, or two-winged flies and to the family Culicidae. This family is characterized by the following adult structures: antennae, figs. 32-38, filamentous and slender, with 15 segments, the first 2 forming the base and the last 13 forming the slender thread. Each segment has a whorl of hairs, which in the males are extremely long. The eyes are large and conspicuous. The mouthparts

consist chiefly of a proboscis (which may be either short and flabby, or elongate and forming a beak) and a pair of maxillary palpi; the palpi are referred to in this report as "palps." The legs are long and spindly. The wings are fairly large; radial sector is 3-branched and Media is 2-branched; the branches of radial sector are either nearly straight or only slightly curved. The family is divided into two subfamilies, the Chaoborinae, or non-biting mosquitoes, and the Culicinae, the true mosquitoes. An adult of the Chaoborinae is readily distinguished from all adult Culicinae because it does not have a beak; each adult of the Culicinae has a well-developed beak or proboscis. The larvae of some Chaoborinae, however, might be readily confused with the larvae of true mosquitoes.

### Terminology

Many special terms are employed for distinctive parts of both adults and larvae of the mosquitoes, and these terms are used throughout the keys and descriptions. Fig. 12 is labeled to identify these distinctive parts of the larvae. Special parts of the

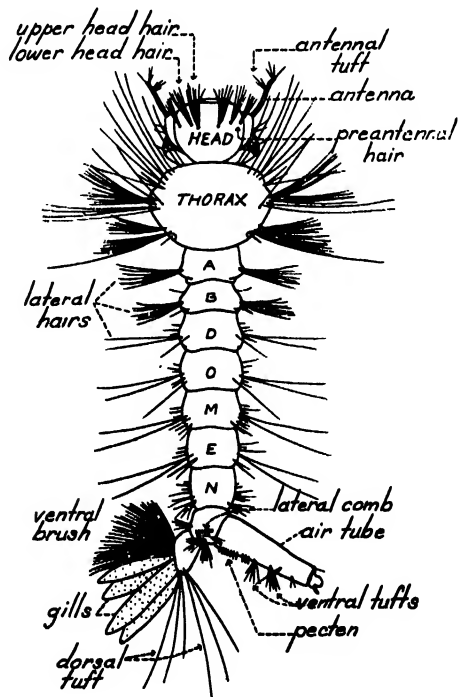


Fig. 12.—Larval diagram, Culicinae. (After King, Bradley, & McNeel.)

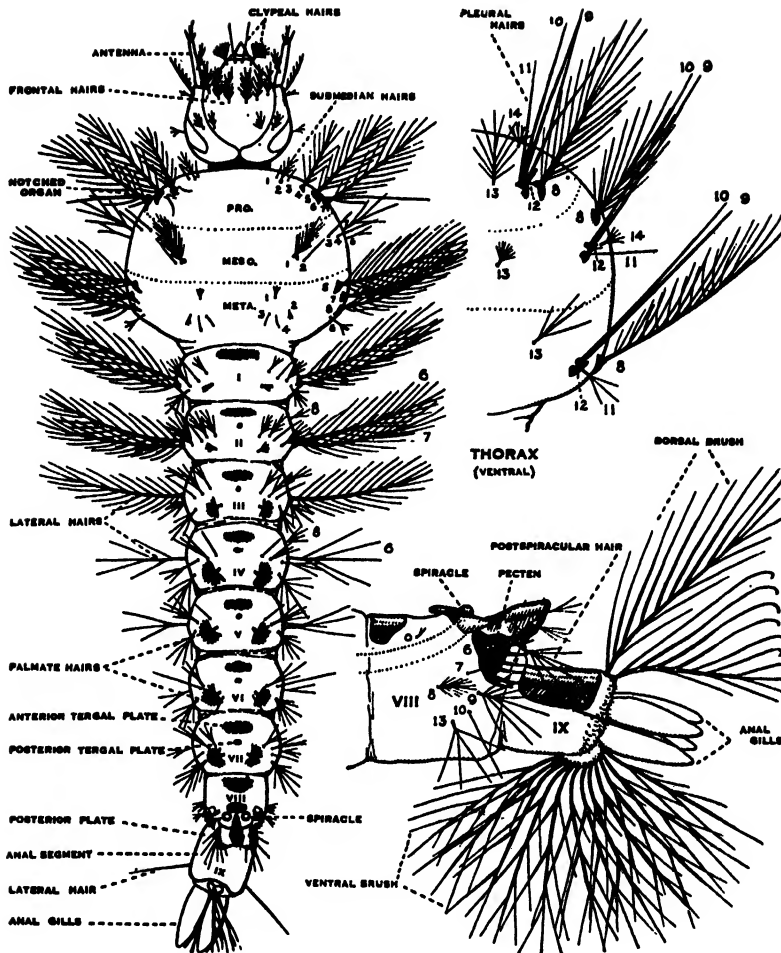


Fig. 13.—*Anopheles* larva. Left figure, dorsal view of entire larva; upper right figure, details of thorax; lower right figure, apex of abdomen, lateral aspect. (After Ross & Roberts, by courtesy of American Entomological Society.)

adults are identified on diagnostic drawings where they appear in the text associated with the keys. Distinctive structures of *Anopheles* larvae are shown in fig. 13.

### Literature

Additional information about mosquitoes, especially species not contained in this report, will be found in the general mosquito reports listed below. Additional information concerning these reports is given in the section "Literature Cited." Papers of more limited scope are mentioned later in the text in reference to particular genera or species.

1928. *The Mosquitoes of the Americas*, by Harrison G. Dyar.

1937. *The Mosquitoes of Minnesota*, by William B. Owen.

1939. *The Mosquitoes of the Southeastern States*, by W. V. King, G. H. Bradley, and T. E. McNeel.

1941. *The Mosquitoes of Arkansas*, by Stanley J. Carpenter.

1942. *The Mosquitoes of Oklahoma*, by L. E. Rozeboom.

1944. *The Mosquitoes of Wisconsin*, by W. E. Dickinson.

1944. *Handbook of the Mosquitoes of North America*, by Robert Mathe-son.

1944. *The Mosquitoes of Texas*, by Texas State Health Department.

1946. *The Mosquitoes of the Southern United States*, by Stanley J. Car-

penter, Woodrow W. Middlekauff, and Roy W. Chamberlain.

### Material Studied

The major part of the material on which this study is based was collected by staff members of the Insect Survey Section, Illinois Natural History Survey. Various other persons or organizations contributed much valuable material, and I am greatly indebted to them for permission to use their records in this paper. J. Lyell Clarke, Des Plaines Valley Mosquito Abatement District, Lyons, Illinois, and M. A. Dobbs and J. M. Gilbert, East St. Louis Health District, contributed extensive material. I wish to express my appreciation to officials of the Chicago Natural History Museum, who allowed me to study their mosquito collections; individual records from their material are marked in this paper with the initials CM. In addition, I am greatly indebted to officials of the U. S. Public Health Service and the Illinois State Department of Public Health for permission to use their extensive records of Illinois mosquitoes; these records are indicated in this paper by the abbreviation USPHS.

### Acknowledgments

I wish to express my gratitude to several workers who were kind enough to check keys and to give advice on many questions which have arisen during the progress of this report. Captains C. F. Gerlach and F. Earle Lyman of the U. S. Public Health Service were very helpful in these matters. I am especially indebted to Dr. Alan Stone, U. S. Bureau of Entomology and Plant Quarantine, who was of the utmost assistance regarding the taxonomic problems which arose time and again. I wish to thank also the officers of the U. S. National Museum for the loan of considerable study material of critical species, especially larval material of rare *Aedes* species.

Dr. C. O. Mohr, Dr. B. D. Burks, and Mr. G. T. Riegel were very active in the earlier years of this project, 1938-1942, in collecting and rearing material. In 1944 and 1945, Dr. Kathryn M. Sommerman and Dr. Milton W. Sanderson aided in this work. Dr. Sommerman and Mr. Riegel did the larger part of the rearing in the laboratory. I am greatly indebted to Dr. Som-

merman for the many original drawings which she made for this report.

Various individuals and organizations were extremely kind in either loaning drawings and cuts for use in this bulletin or in giving permission to reproduce illustrations appearing in their publications. On this score I am especially indebted to Professor Robert Matheson and the Comstock Publishing Company; the American Entomological Society; the Entomological Society of Washington; the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture; and the Malaria Control in War Areas, U. S. Public Health Service.

### KEY TO SUBFAMILIES

#### LARVAE

1. Antennae arising close together on a mesal raised area or protuberance of the head, fig. 14.....*Chaoborinae*  
Antennae arising at sides of head, figs. 12, 13.....2
2. Anal segment with a sclerotized ring or plate, figs. 17-20; antennae without long, prehensile hairs.....*Culicinae*  
Anal segment without either a sclerotized ring or plate; antennae with long, prehensile hairs (*Mochlonyx* and *Eucorethra*), figs. 15, 16.....*Chaoborinae*

#### ADULTS

1. Proboscis elongate, figs. 32-38, many times longer than depth of head.....*Culicinae*  
Mouthparts forming only short submembranous lobes which are no longer than depth of head.....*Chaoborinae*

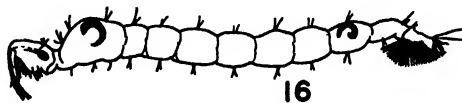


Fig. 14.—Head of larva of *Corethrella*.

Fig. 15.—Larva of *Mochlonyx cinctipes*. (Redrawn from Matheson.)

Fig. 16.—Larva of *Chaoborus punctipennis*. (Redrawn from Matheson.)

## Subfamily CHAOBORINAE

The adults of this subfamily are midge-like; their bodies usually are hairy but without scales. Four genera comprise the North American fauna of the subfamily. Of these, *Chaoborus*, *Corethrella*, and *Mochlonyx* occur in Illinois; the fourth genus, *Eucorethra*, is widely distributed north of Illinois but has not yet been taken in the state. Larvae of *Chaoborus*, fig. 16, have no air tubes. Larvae of the other three genera have either air tubes (*Mochlonyx* and *Corethrella*) or spiracular plates of the *Anopheles* type (*Eucorethra*); in these genera the larvae are predaceous and in general appearance resemble those of some biting mosquitoes.

A synopsis of the North American species, together with keys and illustrations, is presented by Matheson (1944).

## Subfamily CULICINAE

To date, 10 genera of this subfamily, representing the true mosquitoes, have been taken in Illinois. It should be emphasized that this mosquito group includes all the Culicidae with well-developed beaks, many species that bite, and in addition a few species that do not bite.

The subfamily Culicinae is frequently divided into two tribes, the Anophelini, including in the Illinois fauna only *Anopheles*, and the Culicini, including the other nine Illinois genera. However, the subfamily is sometimes divided into a large number of tribes. Since the final solution of this problem in taxonomy will require a study of the world fauna, the most practical solution for the present report has been to avoid segregation into tribes and to treat the subfamily as a single unit.

## Mosquitoes of Illinois

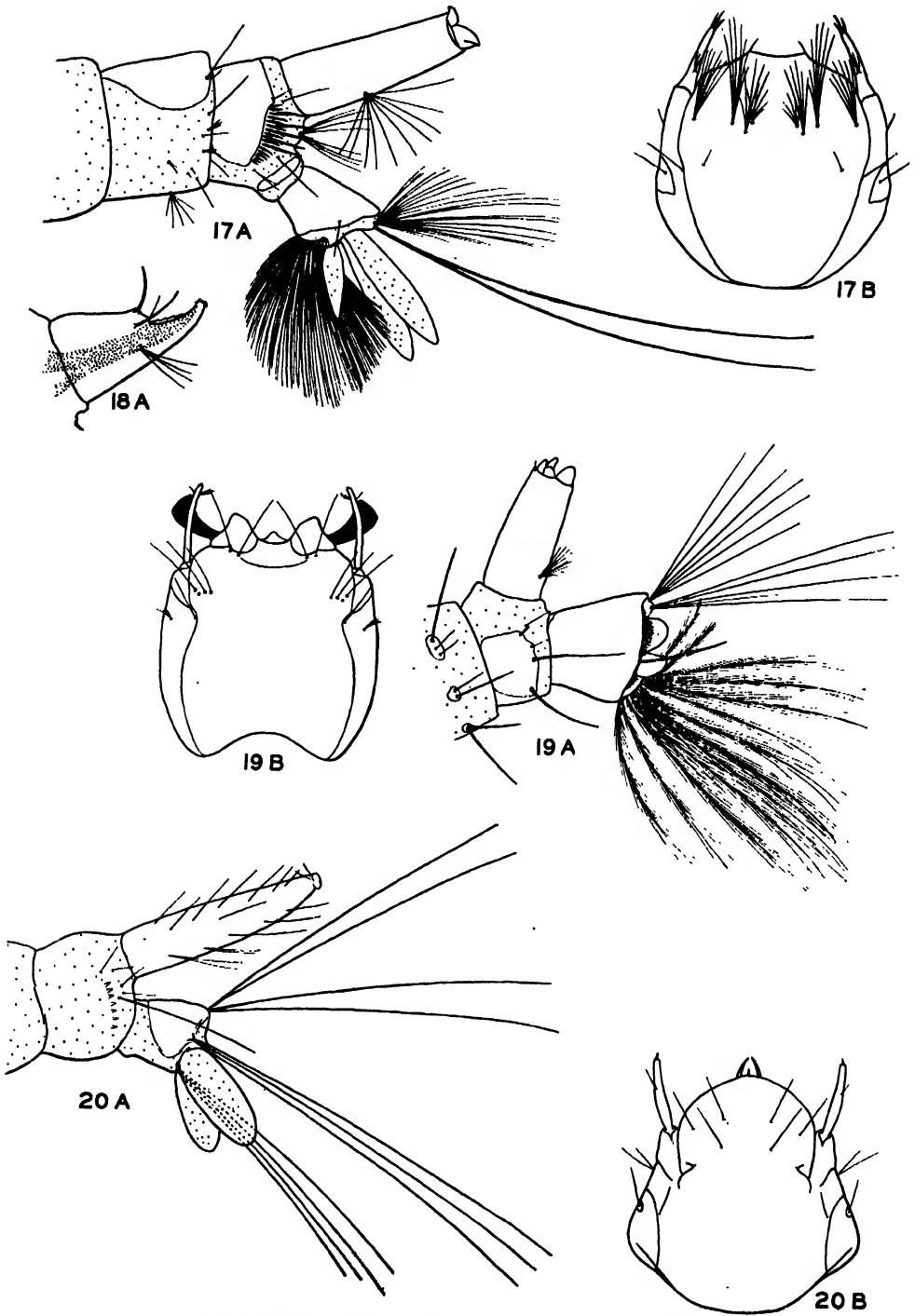
*Aedes aegypti* (Linnaeus)  
*Aedes aurifer* (Coquillett)  
*Aedes canadensis* (Theobald)  
*Aedes cinereus* Meigen  
*Aedes dorsalis* (Meigen)  
*Aedes dupreei* (Coquillett)  
*Aedes excrucians* (Walker)  
*Aedes fitchii* (Felt & Young)  
*Aedes flavescens* (Müller)  
*Aedes fulvus pallens* E. S. Ross  
*Aedes grossbecki* Dyar & Knab

*Aedes implacabilis* (Walker)  
*Aedes mitchellae* (Dyar)  
*Aedes nigromaculis* (Ludlow)  
*Aedes punctor* (Kirby)  
*Aedes sollicitans* (Walker)  
*Aedes spencerii* (Theobald)  
*Aedes sticticus* (Meigen)  
*Aedes stimulans* (Walker)  
*Aedes thibaulti* Dyar & Knab  
*Aedes triseriatus* (Say)  
*Aedes trivittatus* (Coquillett)  
*Aedes vexans* (Meigen)  
*Anopheles barberi* Coquillett  
*Anopheles crucians* Wiedemann  
*Anopheles punctipennis* (Say)  
*Anopheles quadrimaculatus* Say  
*Anopheles walkeri* Theobald  
*Culex apicalis* Adams  
*Culex erraticus* (Dyar & Knab)  
*Culex peccator* Dyar & Knab  
*Culex pipiens* Linnaeus  
*Culex quinquefasciatus* Say  
*Culex restuans* Theobald  
*Culex salinarius* Coquillett  
*Culex tarsalis* Coquillett  
*Culiseta inornata* (Williston)  
*Culiseta morsitans* (Theobald)  
*Mansonia perturbans* (Walker)  
*Megarhinus septentrionalis* Dyar & Knab  
*Orthopodomyia alba* Baker  
*Orthopodomyia signifera* (Coquillett)  
*Psorophora ciliata* (Fabricius)  
*Psorophora confinnis* (Arribáizaga)  
*Psorophora cyanescens* (Coquillett)  
*Psorophora discolor* (Coquillett)  
*Psorophora ferox* (Humboldt)  
*Psorophora horrida* (Dyar & Knab)  
*Psorophora howardii* Coquillett  
*Psorophora varipes* (Coquillett)  
*Uranotaenia sapphirina* (Osten Sacken)  
*Wyeomyia smithii* (Coquillett)

## KEY TO GENERA

## LARVAE

1. Eighth segment with a flat spiracular plate, but no air tube, fig. 13. .1. *Anopheles*  
 Eighth segment with an air tube, figs. 17-20 . . . . .2
2. Air tube short, with some of its sclerites at the apex forming long stout spurlike processes, fig. 18. . . . .5. *Mansonia*  
 Air tube without stout processes, its apical sclerites flat or conical, figs. 17, 19, 20 . . . . .3
3. Ventral brush of anal segment represented by only an apical pair of double hairs, fig. 20. . . . .4. *Wyeomyia*



Larval parts: A, apex of abdomen; B, dorsum of head.

Fig. 17.—*Orthopodomyia signifera*.

Fig. 18.—*Mansonia perturbans* (the air tube only.) (After King, Bradley, & McNeel.)

Fig. 19.—*Megarhinus septentrionalis*.

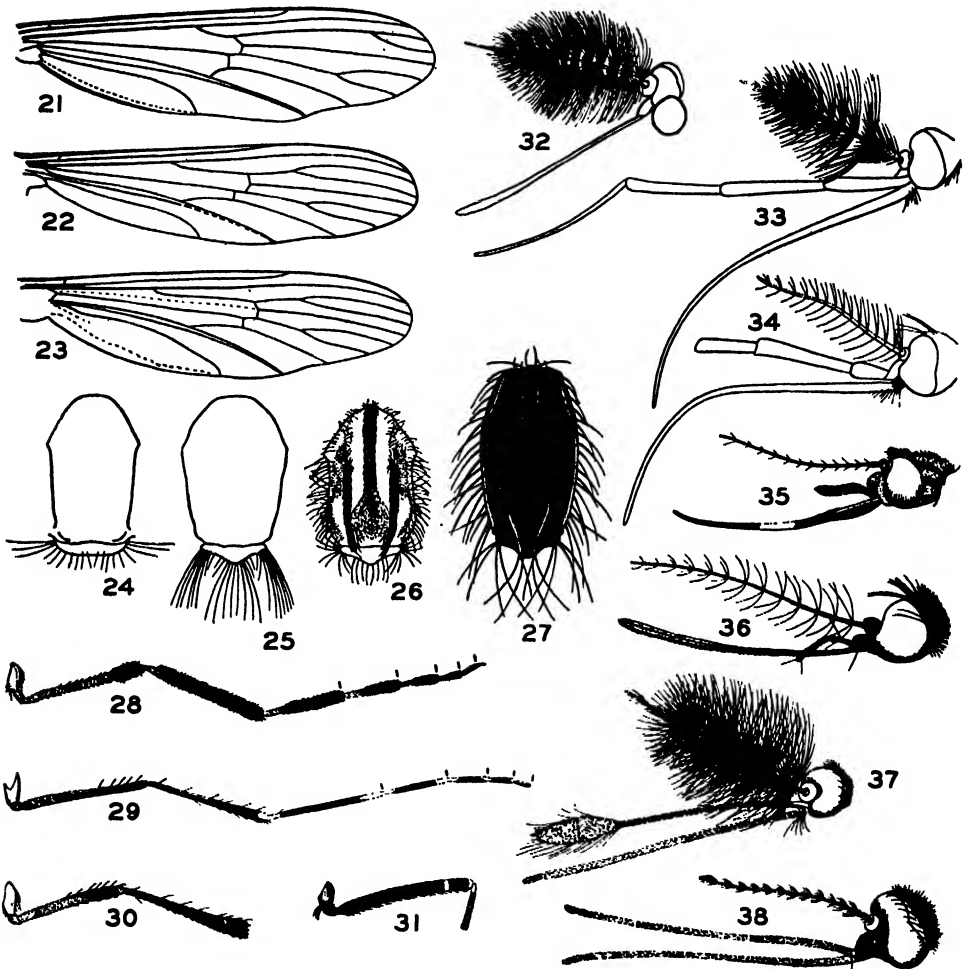
Fig. 20.—*Wyeomyia smithii*. Note ventral brush reduced to only four long hairs.

- Ventral brush of anal segment consisting of several tufts, figs. 17, 19. . . . . 4
4. Anal segment with sclerotized plate not meeting ventrad, figs. 102-105. Many species of. . . . . 9. *Aedes*  
Anal segment completely ringed by sclerotized plate, fig. 17. . . . . 5
5. Air tube cylindrical and without pecten, figs. 17, 19. . . . . 6  
Air tube either fusiform, fig. 175, or with a pecten, figs. 75, 98, 172. . . . . 7
6. Abdominal segments 3-7 with three spine-bearing sclerotized plates on each side, fig. 19A; head quadrate, with stout mouth brushes and only a few single dorsal setae, fig. 19B. . . . . 2. *Megarhinus*  
Abdominal segments 3-7 without lateral plates, sometimes segments 6 and 7 with dorsal saddle, fig. 17A; head oval, with fine bushy mouth brushes and with most of the dorsal setae multiple, fig. 17B. . . . . 6. *Orthopodomyia*
7. Comb teeth situated on the posterior margin of a large sclerotized plate that covers most of the eighth segment; head with four stout black spines; fig. 72. . . . . 3. *Uranotaenia*  
Comb teeth either on a small, poorly defined plate, fig. 172, or not on a plate; head with slender hairs, no stout spines, fig. 74. . . . . 8
8. Air tube with a single pair of ventral tufts situated at base, figs. 74, 75. . . . . 7. *Culiseta*  
Air tube either without ventral tufts, or with tuft near middle or apex, figs. 98-101, or with air tube having several pairs of tufts, figs. 80-85. . . . . 9
9. Air tube with several pairs of ventral tufts of which some may be represented by single long hairs, figs. 79-85. . . . . 8. *Culex*  
Air tube with only a single pair of ventral tufts, or with none. . . . . 10
10. Ventral brush of anal segment having several tufts that arise out of the sclerotized ring, figs. 172-174. . . . . 10. *Psorophora*  
Ventral brush of anal segment with all tufts situated posterior to sclerotized ring, fig. 111. Some species of. . . . . 9. *Aedes*
- ADULTS
1. Fork of  $R_{2+3}$  close to margin of wing, cell  $R_2$  only half length of its petiole,  $R_{2+3}$ , fig. 21. . . . . 2  
Fork  $R_{2+3}$  much farther from margin of wing, so that cell  $R_2$  is as long as its petiole, fig. 22. . . . . 3
2. Beak curved almost into a quarter circle, palps of both sexes very long, those of female massive, figs. 33, 34; large species, wing length 6.5 mm. . . . . 2. *Megarhinus*  
Beak only slightly curved, palps of both sexes short and abortive, fig. 32; small species, wing length under 3.5 mm. . . . . 3. *Uranotaenia*
3. Mesoscutellum with apical margin evenly rounded, the setae arranged evenly along it, fig. 24; male with clavate palps, fig. 37, and female with palps as long as beak, fig. 38. . . . . 1. *Anopheles*  
Mesoscutellum with apical margin incised to form a mesal lobe and two lateral lobes, with the setae grouped on these three lobes, fig. 25; male palps not clavate and female palps short, fig. 35. . . . 4
4. Mesonotum with a mesal line of short setae and scales, and with a wide, polished bare area along each side of the mesal line, fig. 26; hind femur with a tuft of projecting scales at apex, fig. 28. Large species of. . . . . 10. *Psorophora*  
Mesonotum without linear, polished bare areas; hind femur with only a few projecting hairs at apex, fig. 30. . . . . 5
5. Hind tarsi with one or two segments entirely white, the remainder entirely blue or black. A few species of. . . . . 10. *Psorophora*  
Hind tarsi either with some segments banded, fig. 29, or all segments nearly the same color. . . . . 6
6. Hind tarsi with wide or conspicuous bands of white on most segments, fig. 29. . . . 7  
Hind tarsi with no bands or with only inconspicuous ones. . . . . 13
7. Second, third, and fourth tarsal segments each with a narrow white band at each end, fig. 29. . . . . 8  
Second, third, and fourth tarsal segments each with a white band at base only, figs. 127-131. . . . . 10
8. Beak black, with a definite white band in middle, as in fig. 35. The species *tar-salis* in. . . . . 8. *Culex*  
Beak not banded, either all black, or mottled, or black with rows of white scales along its entire length. . . . . 9
9. Mesonotum either without white lines, or generally cream in color as in fig. 119. A few species of. . . . . 9. *Aedes*  
Mesonotum nearly black, with a series of white lines as in fig. 27. . . . . 6. *Orthopodomyia*
10. Post-spiracular area entirely bare; hairs on disc of mesonotum long, abundant, and erect, fig. 39. . . . . 5. *Mansonia*  
Post-spiracular area with bristles or a patch of scales; hairs on disc of pronotum much more appressed, fig. 41. . . . 11
11. Outer faces of hind femora in general dark but each with a transverse band of white scales near apex, fig. 31. A few species of. . . . . 10. *Psorophora*  
Outer faces of hind femora without such bands. . . . . 12



12. Wings with either Costa banded with white-scaled areas and black-scaled areas, or anal vein white scaled for basal two-thirds with apical portion black scaled. A few species of . . . . .10. *Psorophora*  
Wings either almost uniformly white or

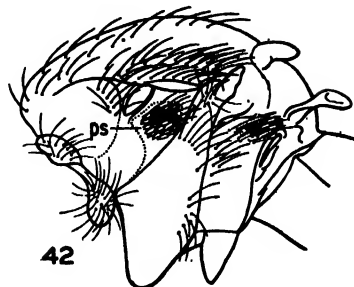
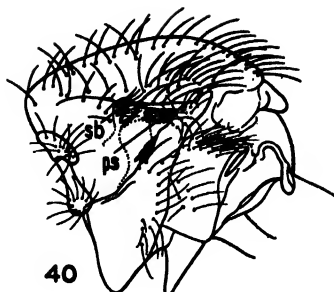
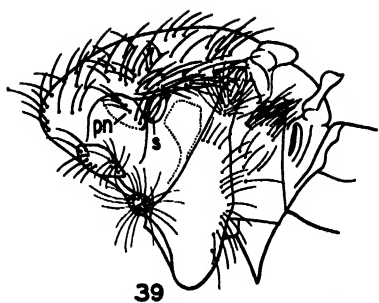
- dark scaled, or the two types of scales muddled in a salt-and-pepper, patternless mixture. Some species of . . . . .9. *Aedes*  
13. Mesonotum covered with a close mat of blue-black scales, with bristles only around periphery; fork of  $R_{5+6}$  basad of fork of  $M_{1+2}$ , fig. 22 . . . . .4. *Wyeomyia*



#### Adult Parts

- Fig. 21.—*Uranotaenia sapphirina*, wing.  
Fig. 22.—*Wyeomyia smithii*, wing.  
Fig. 23.—*Aedes vexans*, wing.  
Fig. 24.—*Anopheles quadrimaculatus*, mesonotum.  
Fig. 25.—*Aedes vexans*, mesonotum.  
Fig. 26.—*Psorophora ciliata*, mesonotum.  
Fig. 27.—*Orthopodomyia signifera*, mesonotum.  
Fig. 28.—*Psorophora ciliata*, hind leg.  
Fig. 29.—*Aedes canadensis*, hind leg.  
Fig. 30.—*Psorophora varipes*, portion of hind leg.

- Fig. 31.—*Psorophora confinnis*, hind femur.  
Fig. 32.—*Uranotaenia sapphirina*, male head.  
Fig. 33.—*Megarhinus septentrionalis*, male head.  
Fig. 34.—*Megarhinus septentrionalis*, female head.  
Fig. 35.—*Aedes sollicitans*, female head.  
Fig. 36.—*Orthopodomyia signifera*, female head.  
Fig. 37.—*Anopheles quadrimaculatus*, male head.  
Fig. 38.—*Anopheles quadrimaculatus*, female head.



Adult Thorax, Lateral Aspect. Abbreviations: *pn*, pronotal bristles; *ps*, post-spiracular bristles or scales; *s*, spiracle; *sb*, spiracular bristles.

Fig. 39.—*Mansonia perturbans*.

Fig. 40.—*Culiseta inornata*.

Fig. 41.—*Psorophora confinnis*.

Fig. 42.—*Aedes stimulans*.

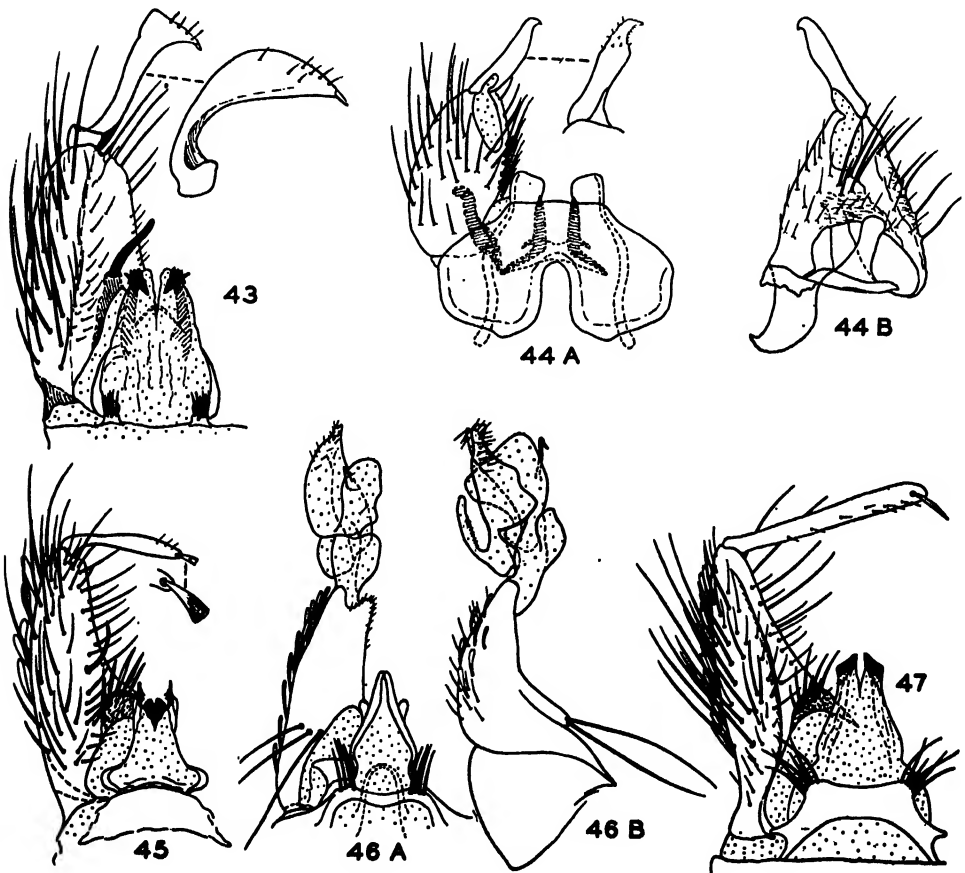
- Mesonotum with several series of erect bristles extending above scales on disc, fig. 42; fork of  $R_{3+4}$  at about same level as that of  $M_{1+2}$ , fig. 23.....14
14. Mesonotum either with broad lateral bands or areas of white or cream scales, figs. 115, 120–123, or almost entirely covered with cream scales.....15
- Mesonotum mostly dark scaled, at most with a scattering of light scales, or with narrow weak lines of them.....16
15. Hind tibiae enlarged and shaggy toward apex, with setae not longer than width of tibia at apex, fig. 30; spiracular bristles usually present, fig. 41. A few species of.....10. *Psorophora*
- Hind tibiae slender to apex, not shaggy, often with a scattering of setae longer than width of tibia at apex, figs. 29, 125, 126; spiracular bristles absent. Many species of.....9. *Aedes*
16. Post-spiracular area bare, and spiracular bristles lacking, as in fig. 39.....8. *Culex*
- Thorax either with post-spiracular area having bristles or scales, fig. 42, or spiracular bristles present, fig. 40, or both.....17
17. Spiracular bristles present; post-spiracular area sometimes with scales but never with hairs, fig. 40.....7. *Culiseta*

Without spiracular bristles; post-spiracular area with hairs or hairs and scales, fig. 42. Many species of.....9. *Aedes*

#### MALE GENITALIA

1. Dististyle with a contorted mass of branches, fig. 46.....4. *Wyeomyia*  
Dististyle either unbranched, fig. 43, or with only one or two simple lobes, figs. 133, 178.....2
2. A pair of subcylindrical arms (claspettes) arising from dorsum of capsulae, and tipped with a sclerotized filament, figs. 136–158. Most species of....9. *Aedes*  
Claspettes absent, platelike, fig. 70, or each tipped with a cluster of spines, fig. 177.....3
3. Dististyle bilobed, its mesal margin bearing a long hook and a large membranous lobe, fig. 178. The species *howardii* in.....10. *Psorophora*  
Dististyle without an accessory membranous lobe.....4
4. Basistyle with an apico-mesal shoulder bearing a cluster of specialized, blade-like or spatulate spines, which are frequently complex in structure, figs. 88–95.....8. *Culex*  
Basistyle either without an apical shoulder, or the shoulder bearing only narrow spines.....5

5. Apex of basistyle continuing as a pointed lobe beyond insertion of dististyle, fig. 135. The species *cinereus* in ..... 9. *Aedes*  
Dististyle situated at apex of basistyle, fig. 43.....6
6. Dististyle with a pointed lobe projecting beyond apical spur, fig. 133. The species *veaxans* in ..... 9. *Aedes*  
Dististyle with apical style terminal, fig. 45, or apex round, fig. 47, or truncate, fig. 180.....7
7. Claspettes each with a stalklike base, and with a comblike cluster of spurs or setae at apex, figs. 177, 179-182; dististyle sinuate, fig. 177, or bulbous, figs. 179-182. Most species of...10. *Psorophora*
8. Basistyle with a stout peglike rod on mesal face near middle; dististyle with apical half very wide, its apical seta forming a stout spurlike tip, fig. 43.....8
9. Basistyle short and ovate, with a pair of large, stout spines dominating the ventral aspect of the basal portion, fig. 70.....1. *Anopheles*  
Basistyle either long and slender, fig. 45,



## Male Genitalia

Fig. 43.—*Mansonia perturbans*, ventral aspect, and lateral aspect of dististyle.

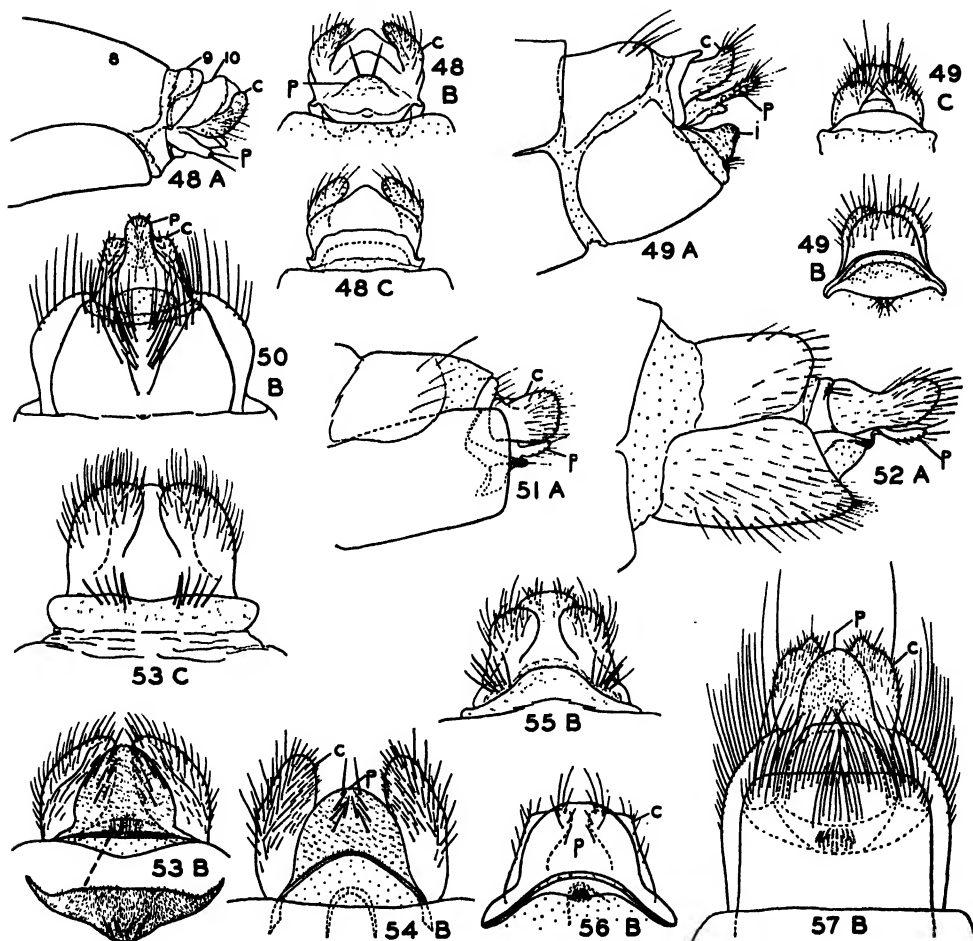
Fig. 44.—*Uranotaenia sapphirina*; A, ventral aspect, with lateral aspect of dististyle; B, mesal aspect of clasper, with mesosome and other mesal structures removed.

Fig. 45.—*Orthopodomyia signifera*, ventral aspect.

Fig. 46.—*Wyeomyia smithii*; A, ventral aspect; B, lateral aspect.

Fig. 47.—*Megarhinus septentrionalis*, ventral aspect.

- or without a pair of isolated stout spines on basal portion of ventral aspect, fig. 44 ..... 10
10. Ninth tergite forming a large bilobed sclerotized plate whose lateral lobes are nearly as long as the basistyle, fig. 44. .... 3. *Uranotaenia*
- Ninth tergite forming at most a plate as wide as in fig. 47 ..... 11
11. Apical seta of dististyle single, slender, and pointed at tip, figs. 47, 134 ..... 12
- Apical seta of dististyle short and either divided, fig. 78, or truncate at tip, fig. 45 ..... 13
12. Base of basistyle with a mesal, arcuate pad bearing a crown of stout spines; dististyle cylindrical, with apical spine just before apex, fig. 47. . . 2. *Megarhinus*
- Base of basistyle without a mesal pad; dististyle tapering toward apex, apical spine issuing from tip, fig. 134. The species *aegypti* in ..... 9. *Aedes*
13. Apical spine of dististyle double, each ray short and stout; mesosome without lateral teeth at apex, fig. 78. . . 7. *Culiseta*
- Apical spine of dististyle cone shaped, wide and truncate at apex, and with what appears to be a minute fringe



Female Genitalia: A, lateral aspect; B, ventral aspect; C, dorsal aspect. Abbreviations: c, cercus; p, postgenital plate; i, insula plate.

Fig. 48.—*Anopheles quadrimaculatus*.

Fig. 49.—*Uranotaenia sapphirina*.

Fig. 50.—*Wyeomyia smithii*.

Fig. 51.—*Mansonia perturbans*.

Fig. 52.—*Orthopodomyia signifera*.

Fig. 53.—*Culiseta inornata*.

Fig. 54.—*Culex restuans*.

Fig. 55.—*Culex apicalis*.

Fig. 56.—*Culex erraticus*.

Fig. 57.—*Megarhinus septentrionalis*.

along the edge; mesosome with a few short, lateral teeth at apex, fig. 45....  
.....6. *Orthopodomyia*

#### FEMALE TERMINALIA

1. Cerci round and finger-like, wide apart and directed almost dorsad, fig. 48....  
.....1. *Anopheles*  
Cerci either closer together, or leaflike and directed posterad, figs. 49-57.....2

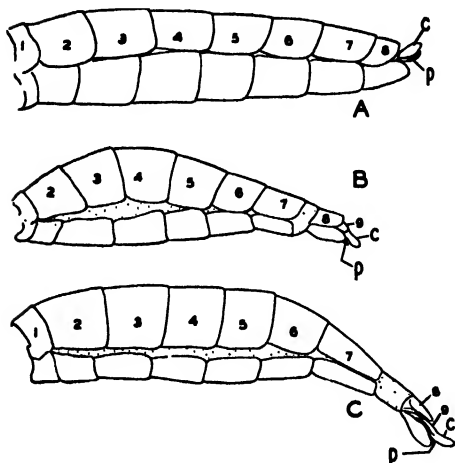


Fig. 58.—Abdomen of adult female, lateral aspect. A, *Culiseta inornata*; B, *Aedes aegypti*; C, *Psorophora ciliata*. Abbreviations: c, cercus; p, postgenital plate.

2. Eighth segment retractile, markedly narrower than seventh and joined to it by a wide band of membrane, figs. 58B, C; cerci either long and narrow, fig. 159, or extending far beyond postgenital plate, fig. 160.....3  
Eighth segment not retractile, practically the same diameter as the seventh, joined to it by a narrow strip of membrane, fig. 58A; cerci short and extending little if at all beyond end of postgenital plate, figs. 49-57.....4
3. Ninth tergite consisting of a fairly wide, indefinitely outlined rectangular dorsal sclerite, figs. 159-167.....9. *Aedes*  
Ninth tergite consisting of a heavily sclerotized, longitudinal rod enlarged at apex and extending basally beneath eighth tergite, fig. 184...10. *Psorophora*
4. Postgenital plate extending considerably beyond cerci, fig. 50....4. *Wyeomyia*  
Postgenital plate extending only slightly if at all beyond cerci, fig. 49.....5
5. Eighth tergite long and wide, forming a flat hood that extends considerably beyond sternite; ninth segment and cerci

- flattened and horizontal, fig. 57.....  
.....2. *Megarhinus*  
Eighth tergite hemicylindrical, shorter than sternite and not at all hoodlike, figs. 49, 52.....6
6. Cerci with base enlarged, middle constricted, and apex expanded, fig. 52....  
.....6. *Orthopodomyia*  
Cerci with base not at all enlarged, but sometimes expanded at apex, fig. 51...7
7. Insula plate well developed as a sclerotized, arcuate, cushion-like crescent, fig. 49; ninth tergite with apical margin rounded and sclerotized, slightly overhanging base of cerci.....  
.....3. *Uranotaenia*  
Insula plate either entirely membranous or forming a band that bears a small mesal tuft of setae, fig. 53.....8
8. Cerci from edge to edge almost vertical in position, the apex markedly widened; eighth sternite nearly twice length of eighth tergite, fig. 51....5. *Mansonia*  
Cerci from edge to edge inclining to horizontal in position, the apex narrowed at least slightly, fig. 53; eighth sternite longer than eighth tergite, but not as much longer as in *Mansonia*.....9
9. Postgenital plate parallel sided and truncate, with a long apical seta near each corner and many small setae on the central area, fig. 161; ninth segment narrow. A few species of.....9. *Aedes*  
Postgenital plate rounded or pointed, with a row or cluster of several scattered setae near apex, fig. 54; ninth segment wide.....10
10. Postgenital plate very wide, as in fig. 56.....8. *Culex*  
Postgenital plate much narrower, figs. 53-55.....11
11. A U-shaped internal sclerite present in membranous folds of spermatheca, fig. 54.....8. *Culex*  
No distinct internal sclerite evident in folds of spermatheca, fig. 55.....12
12. Ninth tergite forming a sclerotized, fairly straight bridge, with a pair of clusters of setae situated close together, fig. 53...  
.....7. *Culiseta*  
Ninth tergite consisting of irregular folds at most semisclerotized, with clusters of setae situated far apart near lateral margins, fig. 55.....8. *Culex*

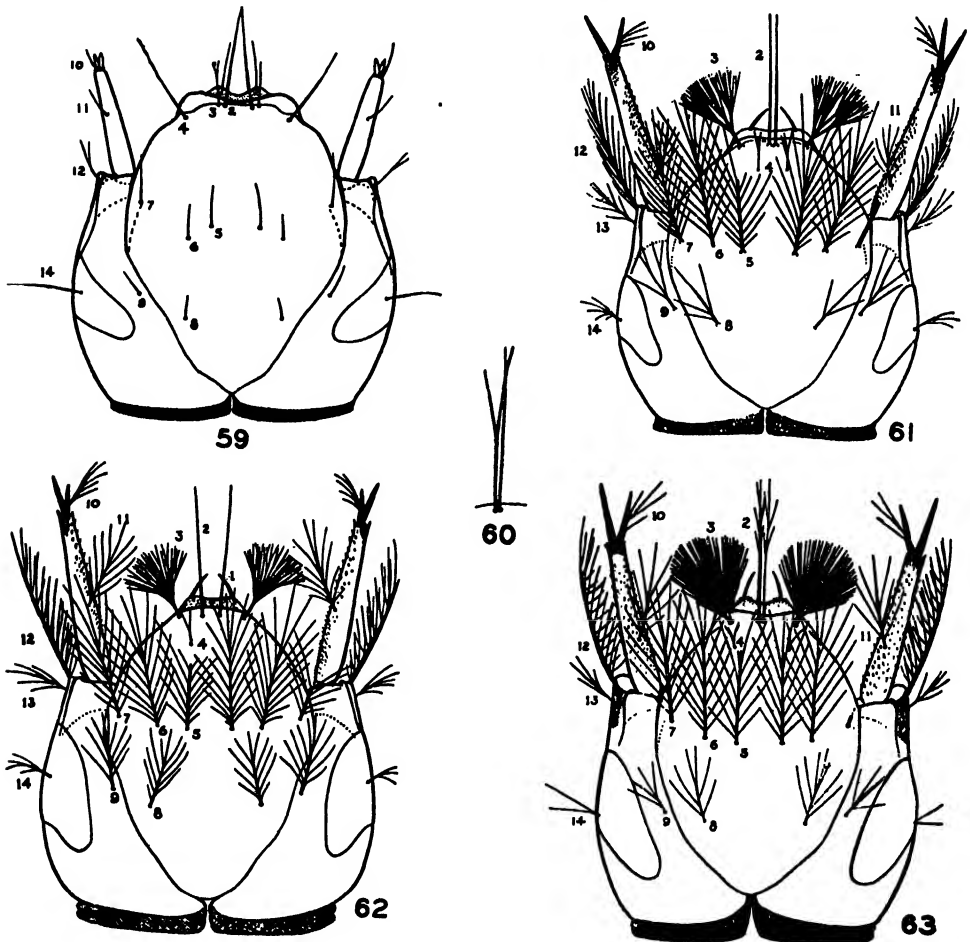
#### 1. ANOPHELES Meigen

Of the Illinois mosquitoes, *Anopheles* is the most distinctive genus and the most important one. The larvae, fig. 13, are readily distinguished by the platelike aper-

ture of the breathing apparatus, which in all other Illinois mosquito larvae is tubular; the adults have the scutellum evenly rounded, not trilobed, and the males have the apical segments of the palps greatly enlarged, fig. 37. According to present information, *Anopheles quadrimaculatus* is the chief carrier of malaria in Illinois.

In proportion to their size, few mosquito genera present so many difficulties regarding larval identification as the North American *Anopheles*. There is undoubtedly much variation within many of the species, both

in the hair arrangement of the larvae and in the details of the male genitalia. Consequently, in Illinois the main basis for identification of the species in this genus should be the adult females. In other sections of the country the larvae may present the only reliable characters for certain complexes of the species. Many keys have been presented for the identification of males by means of the genitalia. The studies of Roth (1944), however, have substantiated my own observation that the characters of the male genitalia can be used only on an average basis



Heads of *Anopheles* Larvae

Fig. 59.—*A. barberi*. (After Ross & Roberts.)

Fig. 60.—*A. occidentalis* (inner clypeal hairs only).

Fig. 61.—*A. punctipennis*. (After Ross & Roberts.)

Fig. 62.—*A. quadrimaculatus*. (After Ross & Roberts.)

Fig. 63.—*A. walkeri*. (After Ross & Roberts.) Hair numerals used on this plate are those currently employed in the taxonomic literature on mosquitoes.

and cannot be used as a means of absolute diagnosis in all cases.

The recent work of Ross & Roberts (1943) and Roth (1944) illustrates extensively many diagnostic and other structural features of this genus. Additional descriptions and a summary of distribution is given by King & Bradley (1941), and biological material by Bradley & King (1941). An interesting study of variation in larval characters has been made by Roth (1945b).

To date, five species of this genus have been taken in Illinois. A sixth, *occidentalis*, has been taken in Iowa across the Mississippi River from Illinois. As it undoubtedly occurs in Illinois, it has been included in the key.

#### KEY TO SPECIES

##### LARVAE

1. Head hairs 5, 6, and 7 short and simple, fig. 59; lateral body hairs with only short feathering.....1. *barberi*  
Head hairs 5, 6, and 7 long and plumose, fig. 61; lateral hairs of thorax and first

- three abdominal segments with long feathering, fig. 64.....2
2. Fourth and fifth abdominal tergites with hairs 0 and 2 plumose, fig. 65.....5. *crucians*  
Fourth and fifth abdominal tergites either with hairs 0 inconspicuous or with hairs 2 only single or double, fig. 64.....3
3. Head hairs 3 very dense, fan shaped from base, so that no basal stalk is evident, fig. 63; head hairs 2 sometimes feathered at tip; prothoracic hairs 1 sometimes branched.....3. *walkeri*  
Head hairs 3 less dense, the fan shaped portion beginning some distance from base so that a basal stalk is formed, fig. 61; head hairs 2 never feathered at tip; prothoracic hairs 1 rarely branched.....4
4. Second abdominal segment with hairs 1 well developed, sclerotized and palmate, fig. 64.....2. *quadrifasciatus*  
Second abdominal segment with hairs 1 small, at most fanlike, fig. 65, not at all like the palmate hairs on segment 3...5

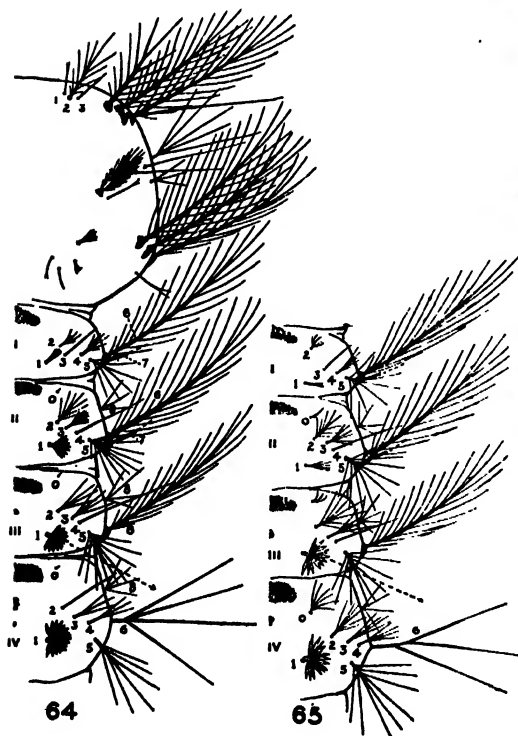
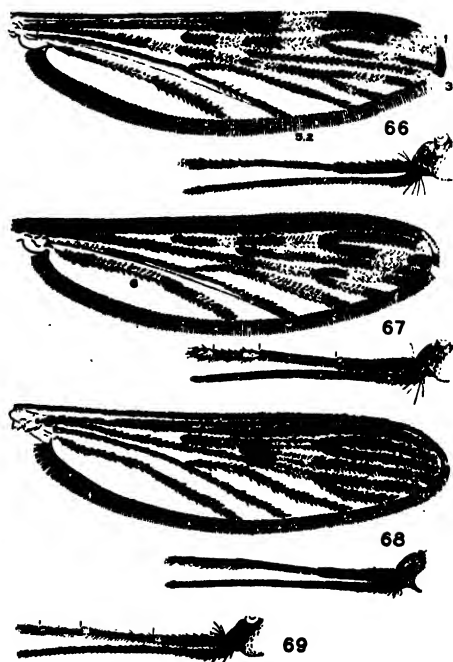


Fig. 64.—*Anopheles quadrifasciatus*, larva, portion of dorsum.

Fig. 65.—*Anopheles crucians*, larva, portion of dorsum.



#### Parts of *Anopheles* Adults

Fig. 66.—*A. punctipennis*, wing and mouthparts.

Fig. 67.—*A. crucians*, wing and mouthparts.

Fig. 68.—*A. quadrifasciatus*, wing and mouthparts.

Fig. 69.—*A. walkeri*, mouthparts. (Figs. 64–69 after Ross & Roberts.)

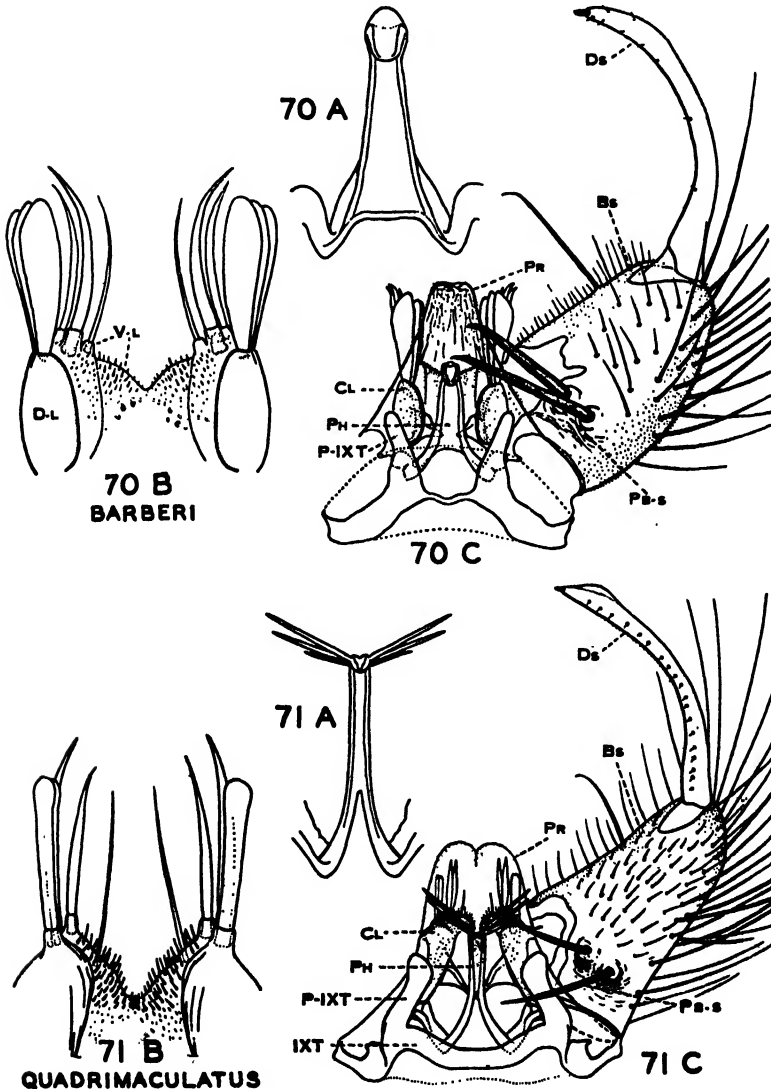
5. Head hairs 2 wide apart, fig. 62.....  
.....2. *quadrimaculatus*  
Head hairs 2 close together, fig. 61.....6
6. Head hairs 2 always simple, fig. 61.....  
.....4. *punctipennis*  
At least one of the two head hairs 2 usually with a conspicuous branch, fig. 60..  
.....*occidentalis*

ADULTS

1. Wings with spots or bars of white or yellowish-white scales along anterior margin and anal vein, figs. 66, 67.....2

Wings without any pale patches, all scales dark, fig. 68, except sometimes apical fringe hairs.....3

2. Anal vein with 3 short dark bars separated by white bars; palps dark with white bands, fig. 67; Costa with a white spot only at apex of wing...5. *crucians*  
Anal vein with apical half and extreme base black, and with a single white area between; palps black, unbanded, fig. 66; Costa with an apical white spot and usually also a preapical spot or bar...  
.....4. *punctipennis*



Figs. 70-71.—Male genitalia of *Anopheles*. A, phallosome; B, clasperettes; C, ventral aspect of entire structure. Abbreviations: Bs, basistyle; CL, clasperettes; Ds, dististyle; IXT, ninth tergite; Pb-s, parabasal spine; Ph, phallosome; P-IXT, process of ninth tergite; Pr, proctiger. (After Ross & Roberts.)



3. Tip of wing with a patch of silvery or golden fringe scales; dark wing spots very pronounced. . . . . *occidentalis*  
Tip of wing with fringe not different from remainder; dark wing spots frequently obscure . . . . . 4
4. Palps narrow and filiform, fig. 38 (females) . . . . . 5  
Palps enlarged into an oval apical club, fig. 37 (males) . . . . . 7
5. Palps black, with white rings, fig. 69 . . . . . 3. *walkerii*  
Palps entirely black, without rings, fig. 68 . . . . . 6
6. Wings without a trace of spotting; wing length about 3.5 mm. . . . . 1. *barberi*  
Wings with definite darker areas giving a spotted appearance, fig. 68; wing length about 5.0 mm. . . . . 2. *quadrifasciatus*
7. Mesosome without leaflets at apex, fig. 70; wing length under 3.5 mm. . . 1. *barberi*  
Mesosome with a cluster of leaflets at apex, fig. 71; wing length over 3.5 mm. . . . . 8
8. Lobes of ninth tergite stout, apex wide, sometimes enlarged, fig. 71 . . . . . 2. *quadrifasciatus*  
Lobes of ninth tergite narrower, usually tapered at apex . . . . . 3. *walkerii*

### 1. *Anopheles barberi* Coquillett

**LARVA.**—Fig. 59. Length 6 mm. Head with almost all hairs simple and unbranched, especially conspicuous being hairs 3, 5, 6, and 7. Thorax and abdomen with only short feathering on lateral major hairs. Segments 3–7 with a pair of palmate hairs, segment 2 with moderately developed palmate hairs. Pecten consisting of an irregular series of long teeth, each tooth with serrations at base.

**FEMALE.**—Wings with veins having almost uniformly dark scales, neither the field of the wing nor the fringe with dark spots or light patches.

**MALE.**—Similar in color and general structure to female. Genitalia, fig. 70, with two large parbasal spines; mesosome tapered, without apical leaflets; claspettes with three setae on the ventral lobe and three broad scales arising in a compact group from the dorsal lobe.

This species contains the smallest individuals of *Anopheles* in North America, mosquitoes that in general appearance are easily confused with small dark *Culex* individuals. The setation of the larvae and structures of the male genitalia separate this species indu-

bitably from all other North American anophelines.

It has been found in only a few of the many tree holes investigated and is either much more critical in its choice of breeding place or much less abundant than several other tree hole species such as *Aedes triseriatus*. As pointed out by King, Bradley, & McNeel (1939), this species has been proved susceptible to malaria parasites but is of doubtful importance in malaria transmission. It is widely distributed in the southern and eastern states.

**ILLINOIS RECORDS.**—Six larvae, collected June 29 to July 6, and many males and females, collected May 25 to October 10, are from Alton (USPHS), Cahokia (USPHS), Camp Ellis (USPHS), Carterville (USPHS), Crab Orchard Lake (USPHS), Des Plaines, East Alton (USPHS), East St. Louis, George Field (USPHS), Hampshire (USPHS), Johnston City (USPHS), Marion (USPHS), Momence, Mount Vernon (USPHS), Onarga, Savanna (USPHS), Scott Field (USPHS), and Springfield (USPHS).

### 2. *Anopheles quadrifasciatus* Say

**LARVA.**—Fig. 62.—Length 8 mm. Head with hairs 2 long, simple and widely separated; hairs 3 plumose, branching some distance from base; hairs 5, 6, and 7 long and plumose. Thorax and first three segments of abdomen with long feathering on lateral major hairs. Abdominal segments 4 and 5 with hairs 2 usually single, rarely double; of the total of four "hair 2's" on segments 3 and 4, seldom is more than one double. Palmate hairs on segments 3 to 7, frequently also on segment 2. Pecten with a series of well-spaced long teeth, between each of which is a group of three or four short teeth. Body hairs shown in fig. 64.

**FEMALE.**—General color dark brown. Palps entirely dark brown to black, with no annulations. Wings, fig. 68, uniformly dark scaled, the scaling slightly darker at the fork of  $R_{3+4}$ ,  $M_{1+2}$ , the base of  $R_1$  and the base of  $R_{4+5}$ . These darker scalings make four dark spots, sometimes very pronounced, sometimes scarcely perceptible.

**MALE.**—Similar in color and general structure to female. Genitalia, fig. 71, with two large parbasal spines; mesosome slender, its apex with a group of three leaflets on each side; claspettes each with setae of dorsal lobe round at tip, those of ventral lobe sharp and pointed. The number of setae on each lobe varies considerably; if

only two or three are present on the dorsal lobe, they may fuse at the tip.

The diagnosis of this species is clear cut only in the female. The separation of the larvae of this species from those of *punctipennis* is frequently difficult. Nearly all the specimens I have seen from Illinois will key out without difficulty, but an occasional larva is encountered that falls squarely between the two alternatives of couplet 5. In our series of associated larval skins, there is considerable variation in the branching of hair 2 on abdominal segments 4 and 5; the more reliable character seems to be the distance apart of head hairs 1. The males are extremely close to those of *walkeri*, although in all of our specimens the separation on the lobes of the ninth tergite is fairly satisfactory. The halteres of *quadrimaculatus* are usually much darker than those of *walkeri*, but these characters vary somewhat, and, in preserved specimens, the difference tends to disappear with time.

In Illinois, the breeding season of *quadrimaculatus* begins nearly a month after that of *punctipennis* in the south and of *walkeri* in the north, indicating a restriction imposed by water temperature. The preference for warmer water is further suggested by the abundance of *quadrimaculatus* in more open and still bodies of water during the heat of the summer when *punctipennis* is found only in more heavily shaded or markedly cooler waters. The habitat preference of *quadrimaculatus*, which is quite wide, includes small pools, backwaters, and shallow basins of large lakes and marshes. Abundant populations of larvae are almost always associated with emergent vegetation, ranging from plants such as *Jussiaea diffusa*, which never extends more than a few inches above the water surface, to cattails, rushes, and shrubs reaching a height of several feet. We have a few records of *quadrimaculatus* living in running water, but these were in situations where the water was shallow and warm, and the flow extremely sluggish.

Biting records indicate that the females are crepuscular and nocturnal. On cloudy days we have noticed a tendency for the females to bite early in the afternoon, but normally they bite no earlier than shortly before dusk. Their bites are seldom painful and often go unnoticed.

This species is considered the most important carrier of malaria in the United States east of the Rocky Mountains.

**Illinois Records.**—Many larvae, collected June 2 to October 1, and many males and females, collected May 16 to November 15, are from Algonquin, Antioch, Belleville (USPHS), Benton, Bonnie, Cahokia (USPHS), Cairo (USPHS), Camp Ellis (USPHS), Camp Grant (USPHS), Carbondale, Carterville (USPHS), Caseyville, Champaign, Chanute Field (USPHS), Charleston, Crab Orchard Lake (USPHS), Danville (USPHS), Decatur (USPHS), Detroit, Dubois, Dwight (USPHS), East Alton (USPHS), East Hannibal, East Moline (USPHS), East Peoria (USPHS), East St. Louis, Edgemoor, Edwardsville, Elgin, Elsau, Evansville, French Village (USPHS), Galesburg (USPHS), George Field (USPHS), Gibson City (USPHS), Gibsonsia, Glendale, Gorham, Grafton (USPHS), Grand Tower, Granite City (USPHS), Hampshire (USPHS), Havana, Hecker, Herod, Herrin, Hull, Johnston City (USPHS), La Rue, Lawrenceville (USPHS), Makanda (USPHS), Marion (USPHS), Milford (USPHS), Mississippi Palisades State Park, Momence, Mound City (USPHS), Mount Vernon (USPHS), Mulberry Grove, Oakwood, Olive Branch, Olney, Omaha, Palos Park, Pere Marquette State Park, Port Byron, Rockford (USPHS), Rock Island (USPHS), St. Jacob, St. Joseph, Savanna, Scott Field (USPHS), Seneca (USPHS), Springfield (USPHS), Starved Rock State Park, Thomson, Urbana, Ursa, Vienna, Waltersburg, and Ware.

### 3. *Anopheles walkeri* Theobald

**LARVA.**—Fig. 63. In size and general color similar to *quadrimaculatus*. General structure of head and body as described for *quadrimaculatus*, except for the following differences: head hairs 2 close together, in our Illinois specimens almost always single and very long, rarely with one or two fine branches near tip. Abdomen sometimes with well-developed palmate hair on segment 2, segments 4 and 5 with hair 2 usually single and very long, rarely double or triple. The best diagnostic character found to date is head hair 3, which is densely branched from the base and therefore lacks a basal stalk.

**FEMALE.**—In color similar to *quadrimaculatus* with the exception of the palps, fig. 69, which are black with a narrow white annulation at each joint. The wing spotting is identical with that of *quadrimaculatus*.

**MALE.**—Genitalia very similar to those of *quadrimaculatus*, differing in the more slender lobe of the ninth tergite; usually the ventral lobe of the claspette has only one stout and one slender seta.

It is noteworthy that the diagnostic characters for the larvae of this species, which have been stressed by King & Bradley (1941) and by Ross & Roberts (1943), are not applicable to Illinois specimens. Following are characters listed by these authors and, in parentheses, my own observations on Illinois specimens: head hair 2 finely branched at tip (only an occasional Illinois specimen has these hairs branched and then with only one or two branches); prothoracic hair 1 branched (this hair is usually single in Illinois specimens); and hair 0 distinct and many branched (in only a rare Illinois specimen is hair 0 discernible). The densely tufted head hair 3, however, is an excellent diagnostic character, our associated larval skins indicate. This same character is well illustrated by Ross & Roberts.

This species is abundant in the marshes of extreme northeastern Illinois. Outside of this area we have Illinois records from only three widely separated localities, all from the Mississippi River valley region. These three localities are Savanna and nearby Thomson (the northwestern corner of the state), East Hannibal (almost at the center on the western margin), and Scott Field (a short distance south of the St. Louis area). All our collections have been made in cat-tail marshes, to which this species appears to be restricted. In the northeastern corner of the state this species is found in practically every marsh and bog in which cat-tails are found. The larvae have never been found there in abundance. Collecting which nets one larva per five dips is unusual; usually the proportion is closer to one larva per 20 dips. The marshes, however, are very extensive in this section, and the species is quite abundant. Unlike the females of *quadrimaculatus*, the *walkeri* females bite readily during the day as well as during the evening. In early summer they are especially vicious and will attack a person in bright sunlight.

In northeastern Illinois, adults and full grown larvae have been collected early in June and also late in October. The species has a great tolerance for cool water and is similar to *A. punctipennis* and *Guliseta inornata* in this respect.

It is interesting to note that *walkeri* is considered rare south of northern Illinois. In northern Illinois and northward, it is one of the dominant species of the anopheline populations, as shown by our Illinois collec-

tions and by studies in Minnesota and Wisconsin by Daggy, Muegge, & Riley (1941).

**Illinois Records.**—Larvae, taken May 19 to September 15, and many males and females, collected May 19 to November 1, are from Antioch, Beach, Camp Grant (USPHS), Cary, East Hannibal, Fox Lake, Franklinville, Great Lakes Naval Training Station, Lake Bluff, Lake Zurich, Orland Park, Savanna (USPHS), Scott Field (USPHS), Thomson, Volo, Wauconda, Waukegan, Woodstock, and Zion.

#### 4. *Anopheles punctipennis* (Say)

**LARVA.**—Fig. 61. Length 8 mm. Color and general conformation of hairs on head and body as for *quadrimaculatus*. Diagnostic characters as follows: head hairs 2 long and single, the pair close together at base; head hairs 3 each with multiple branching that begins some distance from the base, so that the base of the hair forms a distinct stalk; palmate hair of second abdominal segment reduced; abdominal segments 4 and 5 with hairs 2 usually double, occasionally single or triple, the single, double, or triple hairs occurring in almost any combination on different specimens.

**FEMALE.**—Body dark brown, with the mesonotum clothed with grayish scales and the wings definitely patterned with dark and cream color. Palps entirely dark without white annulations. Typical wing pattern, fig. 66, having a white costal patch near apex and a preapical white patch one-third the distance between apical spot and base of wing, this preapical spot including adjacent portions of C, R<sub>1</sub>, and R<sub>2+3</sub>; in addition there are variable areas of white scales near the base of R<sub>4</sub> and M, M<sub>1+2</sub>, M<sub>3</sub>, and M<sub>4</sub>; a diagnostic and stable area of white scales occupies most of the basal half of the anal vein.

**MALE.**—General structure and color, especially wing pattern, as for female. Genitalia in general as for *quadrimaculatus* with the following average differences in the claspette: dorsal lobe usually with only one seta, which may be round or pointed at apex; ventral lobe usually with only one stout and one narrow seta in addition to one or two short setae.

Occasional larvae are found that seem to bridge the gap between *punctipennis* and *quadrimaculatus*. The number of such larvae, however, appears so small as to be of no statistical importance in proportional

counts because 99 per cent of all the larvae taken can be identified with certainty.

Extreme variation of wing pattern has been found in Illinois material of this species. Two wing spots appear to be constant, the apical costal spot and the white bar on the base of the anal vein. All the other spots vary greatly, and occasionally additional white bars appear on practically all the radial and medial veins. The pre-apical spot is subject to the most conspicuous variation. Usually it is about one-half as long as the dark bar separating it from the apical spot. In the light extremes, the pre-apical spot may be fully as long as this dark bar; in dark extremes the preapical spot may be only a quarter or a sixth as long as the bar; and in rare instances no preapical spot may be present. Our collections indicate that there is no particular significance to these variations. We have taken a wide range of these types in a single collection from one locality, and seldom does a large collection from one locality present even a reasonable homogeneity in regard to wing spots.

In Illinois, *punctipennis* is undoubtedly the most widespread and common species of *Anopheles*. It breeds in a wider variety of aquatic situations than the other species in the genus. We have taken it in running streams, backwaters of lakes, cattail marshes, densely wooded cypress swamps, and open and practically barren pools. In southern Illinois, it is the earliest anopheline to make its appearance, the first adults usually emerging by about the middle of April. In the northern part of the state, mature larvae and pupae have been collected in the middle of October. In early spring it shows a preference for open sunlit water. In the heat of summer, at least in southern Illinois, it leaves the open situations almost entirely and breeds in fairly densely shaded situations, such as pools and creek beds, running streams, cypress swamps, or woodland pools. Both seasonal distribution and habitat indicate a preference for cooler water than that frequented by *quadrimaculatus*. In the northern part of the state this segregation is not so pronounced; here *punctipennis* and *quadrimaculatus* are frequently taken together in the same body of water.

Although *punctipennis* is extremely widely distributed, it has never been found in the tremendous local abundance that characterizes populations of *quadrimaculatus*. Evi-

dence at present indicates that *punctipennis* is not an important carrier of malaria under natural conditions, although the species becomes infected readily under experimental conditions.

**Illinois Records.**—Many larvae, collected May 14 to October 14, and many males and females, collected April 17 to November 29, are from Albion, Algonquin, Belleville (USPHS), Brubaker, Cache, Cahokia (USPHS), Cairo, Calvin, Camp Ellis (USPHS), Camp Grant (USPHS), Carbondale, Carterville (USPHS), Champaign, Chanut Field (USPHS), Charleston, Council Hill, Crab Orchard Lake (USPHS), Decatur (USPHS), Dixon Springs, Dwight (USPHS), East Alton (USPHS), East Moline (USPHS), East Peoria (USPHS), East St. Louis, Edwardsville, Effingham, Elsah, Epworth, Florence, Forest Glen, Fox Lake, Fox Ridge State Park, French Village (USPHS), Fulton (USPHS), Galesburg (USPHS), George Field (USPHS), Giant City State Park, Gibson City (USPHS), Gorham, Gossett, Grafton (USPHS), Grand Tower, Granite City (USPHS), Grantsburg, Greenville, Grimsby, Hamilton, Havana, Herod, Herrin, Joetta, Johnston City (USPHS), Jonesboro, Kankakee, Karnak, Keithsburg, Laclede, La Grange, Lake Villa, La Rue, Lawrenceville (USPHS), Lima, Maroa, Marion (USPHS), McClure, Michael, Mill Shoals, Mississippi Palisades State Park, Momence, Mount Carmel, Mount Vernon (USPHS), Mulberry Grove, Muncie, Neoga, New Athens, New Haven, Nutwood, Oakwood, Oak Park, Olney, Omaha, Palos Park, Pere Marquette State Park, Pingree Grove, Pittsburg, Pittsfield, Quincy, Richmond, Ridge Lake, Rising Sun, Rockford (USPHS), Rock Island (USPHS), Rockton, St. Jacob, St. Joseph, Salem, Savanna (USPHS), Scott Field (USPHS), Seneca (USPHS), Springfield, Starved Rock State Park, Sugar Grove, Thomson, Urbana, Ursa, Utica, Viola, Waltersburg, Ware, Waterloo, Wauconda, White Heath, White Pines Forest State Park, Willow Springs, Wolf Lake, and Zion.

##### 5. *Anopheles crucians* Wiedemann

**LARVA.**—Fig. 65. Color, size, and general conformation of hairs on head and body as for *quadrimaculatus*. Diagnostic characters as follows: head hairs 2 long and single, the pair close together at base; head hairs 3 each with multiple branching that begins some distance from base, so that the base of the hair forms a distinct stalk; palmate hair of second abdominal segment reduced; abdominal segments 4 and 5 with hairs 0 and 2 multiple and conspicuous.

**FEMALE.**—Body dark brown, the mesone-

tum clothed with linear areas of grayish scales, and the wings patterned with dark and cream color. Palps dark, with the short apical segment white and with a conspicuous white band at the base of the third segment. Typical wing pattern, fig. 67, having the costal margin entirely dark scaled except for a white patch at the apex of the wing; in addition there are areas of white scales on all the veins posterior to  $R_1$ ; a diagnostic feature is the alternation of white and dark-scaled areas on the anal vein.

**MALE.**—General structure and color, especially wing pattern, as for female. Genitalia very similar to those of *punctipennis* males.

In Illinois this species has been taken in numbers only in the St. Louis area and southward. Two apparent stragglers have been taken north of this area, one at Havana and one at Peoria. The species is widespread south of Illinois, and our records represent probably the northern edge of its range.

Our only larval records are from cattail marshes in the Mississippi River valley. In an extensive cattail marsh at La Rue, Illinois, this species was especially abundant. The larvae were taken in company with those of *quadrimaculatus*, which outnumbered the *crucians* larvae almost two to one. Light trap collections indicate that *crucians* is never a dominant feature of the mosquito fauna in Illinois.

**Illinois Records.**—Many larvae, collected May 22 to October 1, and many males and females, collected June 16 to October 4, are from Alton (USPHS), Cache, Cahokia (USPHS), Carterville (USPHS), Crab Orchard Lake, East Alton (USPHS), East St. Louis, Granite City (USPHS), Havana, Herrin, Johnston City (USPHS), La Rue, Marion (USPHS), Mount Vernon (USPHS), Peoria (USPHS), and Scott Field (USPHS).

## 2. *MEGARHINUS* Robineau-Desvoidy

Individuals of this genus are among the most peculiar in the state. The adults are large and brilliantly colored. The proboscis is markedly curved, as in figs. 33 and 34, not adapted for biting but for feeding on nectar. The larvae as well as the adults are very large and may be identified immediately by the small sclerotized plates upon which many body setae are situated. The larvae are restricted to tree holes, in which they are predaceous upon other mosquito

larvae. According to previous workers, the eggs are laid singly on the surface of the water.

Only a single species, *septentrionalis*, has been taken in Illinois. The only other Nearctic species, *rutilus* Coquillett, is very closely allied and has never been collected north of the extreme southeastern United States.

### 1. *Megarhinus septentrionalis*

Dyar & Knab

**LARVA.**—Fig. 19. Head quadrate, with well-developed mouth brushes; antennae very short, with only one or two minute setae; dorsum of head with only a few minor setae. Body hairs long and stout, each segment of thorax with one sclerotized plate bearing the dorsal lateral tuft and another bearing the ventral lateral tuft. Segments 1–7 of the abdomen with the long seta situated on tubercle-like sclerotized plates, the first segment with four on each side, the remaining segments with three, each bearing one to several long setae. Eighth abdominal segment with a large lateral sclerite bearing several long apical setae and representing the lateral comb. Air tube short and stout, with a pair of ventral tufts near base. Anal segment large, completely enclosed in a heavily sclerotized ring, and having short budlike gills and hair tufts as in fig. 19.

**FEMALE.**—Length of wing 7 mm. Body and appendages with metallic iridescent scales. Palps and beak a mixture of bluish-purple and gold scales, dorsum of head greenish. Mesonotum with lateral and mesal stripes of greenish gold, the intervening bands black, purple, and green. Dorsum of abdomen almost entirely greenish purple, apical segments with a few lateral patches of silvery scales; venter almost entirely creamy gold, with a mesal greenish-purple stripe. Legs, for the most part, purplish; the middle and hind tarsi with the second, third, and fourth segments white; the hind tarsi with the fourth and fifth segments white; the femora with the base and posterior face of each mostly cream. Wings entirely purple scaled. The female genitalia are dorso-ventrally compressed, fig. 57, and in this respect the species is quite unlike any other Illinois mosquito group.

**MALE.**—In size and general color similar to female. The tarsi are black, except for the fourth segment of the hind tarsi, which

is clothed with dirty white scales. The palps are very long and black, fig. 33. Male genitalia, fig. 47, fairly simple in general structure, resembling in many respects those of *Culiseta*; differing most markedly in the shape of the dististyle and ninth tergite.

We have only a few scattered records of this species, all from the southern third of the state. Our records from Carbondale are based on captures of free-flying adults; specimens from Scott Field and Edwardsville were collected as immature stages in tree holes in oak-hickory woods. The species has been reported as widespread throughout the southeastern states.

**Illinois Records.**—CARBONDALE: Aug. 7, 1927, 1 ♀; 1941, 2 ♂; EDWARDSVILLE: Sept. 24, 1943, from tree hole, 1 ♀; SCOTT FIELD: Aug. 13, 1942, tree hole, 2 larvae; Aug. 24, 1942, fallen-tree hole, 1 ♂; Sept. 16, 1942, tree hole, 1 larva.

### 3. *URANOTAENIA* Arribáizaga

Individuals in this genus are small. Both adults and larvae present a number of distinctive characters that set them off readily from other mosquitoes in Illinois. Of the three species of *Uranotaenia* known to occur in North America, only one has been taken in Illinois.

#### 1. *Uranotaenia sapphirina* (Osten Sacken)

**LARVA.**—Fig. 72. Length 5 mm. Head elongate, the upper and lower head hairs represented by long stout spines. Antennae short with a few sharp spines at apex. Thorax and first two segments of abdomen with long stout lateral hairs, abdominal segments 3–7 with only fine tufts of hairs. Lateral comb of eighth segment represented by a large sclerotized plate bearing a row of 8 to 10 teeth on its apical margin. Air tube elongate and slender, the pecten distinct and containing about 15 spines, the ventral tuft large and situated at the end of the pecten. Anal segment longer than deep, completely encircled by the sclerotized ring, the anal gills finger-like, slender, but only about as long as the anal segment.

**FEMALE.**—Length of wing 2.5 mm. Palps minute and budlike. Head and thorax, including beak, dark-brown scaled; dorsum of head, antero-lateral lobe of pronotum, patches of scales on the pleurae, a narrow line on the extreme edge of the mesonotum,

and a narrow mesal line down the pronotum, from near the anterior margin to the tip of the scutellum, bright iridescent blue. Abdomen dark brown with irregular apical patches of dirty white scales at the apex of some segments. Legs dark brown, each with a small conspicuous knee patch and a small patch on upper side of tip of tibia, each patch consisting of a cluster of white scales. Wings brown scaled, except for a line of blue scales covering the stem of Cubitus. All the brown scales of the wings and legs are iridescent, appearing greenish blue in certain lights.

**MALE.**—Similar in size and general structure to female; in this sex also the palps are small and budlike, fig. 32. Genitalia, fig. 44, with basistyle short and robust and with a cluster of five or six longer spines on the mesal face; dististyle short, the apex narrowed and hooked, without conspicuous apical seta. Ninth tergite developed into a very large bilobed plate that extends over the tenth segment and mesosome.

The larvae of this species, which is widespread in Illinois, live in permanent or semi-permanent ponds, preferring weed-choked situations. In northern Illinois they occur in several cattail marshes and in southern Illinois are usually associated with dense marginal growths of *Jussiaea*, especially

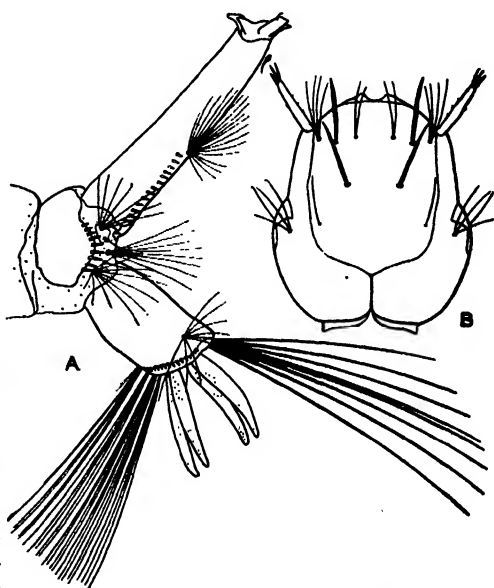


Fig. 72.—*Uranotaenia sapphirina*, larva. A, apex of abdomen, lateral aspect; B, dorsum of head.

where this plant occurs in combination with cattails or other marsh plants. They are very much like anopheline larvae in peculiarities of movement when diving or coming to the surface. The species appears fairly late in the season, apparently in response to the warmer waters of the summer season. The adults apparently do not bite. Presumably they feed on nectar. The females lay eggs in irregular rafts on the surface of the water.

This species has a wide range that embraces most of the United States east of the Great Plains and has at least scattered records from Minnesota to the extreme southern states. It has been reported from southern Illinois by both Chandler (1920) and Matheson (1930) and from various localities in the Chicago area by Gerhard (1910).

**Illinois Records.**—Larvae, collected June 3 to August 27 and many males and females, collected May 23 to October 21, are from Cahokia (USPHS), Cairo (USPHS), Camp Grant (USPHS), Carterville (USPHS), Chanute Field (USPHS), Charleston, Crab Orchard Lake (USPHS), East Hannibal, East St. Louis, Edwardsville, Effingham, Elgin, Elsah, Fox Lake, Fox Ridge State Park, Gibsonia, Gossett, Grafton (USPHS), Granite City (USPHS), Great Lakes Naval Training Station, Havana, Hecker, Herod, Herrin, Homer, Johnston City (USPHS), Lake Glendale, La Rue, Marion (USPHS), Mount Carmel, Mount Vernon (USPHS), Muncie, Oakwood, Omaha, Ottawa, Peoria (USPHS), Putnam, Raymond, Salem, Savanna, (USPHS), Scott Field (USPHS), Seneca (USPHS), Springfield (USPHS), Starved Rock State Park, Sugar Grove, Thomson, Urbana, Volo, Wauconda, and White Pines Forest State Park.

#### 4. *WYEOMYIA* Theobald

This genus is represented in Illinois by only the pitcher plant mosquito, *smithii*. The males are readily identified by the curious shape of the dististyle, fig. 46. The larvae, fig. 20, have very distinctive characters in the structures of the terminal segments.

##### 1. *Wyeomyia smithii* (Coquillett)

**LARVA.**—Fig. 20. Length 6 mm. Head longer than wide, somewhat ovate, antennae short, without conspicuous lateral tufts. Dorsum of head with only a few indistinct hairs. Body hairs very long. Eighth segment with a lateral comb consisting of about eight scales arranged in a straight

row. Air tube small, slender, with about 15 pairs of long single hairs scattered along its length. Anal segment almost ringed by the sclerotized plate. The apex of this plate bears dorsally two pairs of long double hairs and a single pair of lateral double hairs; at the postero-ventral corner of the plate is a pair of double or triple hairs. No ventral brush is present. The anal gills, two in number, are large and sausage shaped; a second pair of gills may be represented by a pair of small swellings above the base of the conspicuous gills.

**FEMALE.**—Length of wing 3 mm. Beak, dorsum of head, mesonotum, and dorsum of abdomen almost uniformly covered with a mat of iridescent bluish-black scales. Pleurae and venter uniformly covered with creamy or silver scales. Scales of mesonotum forming a dense appressed mat without setae projecting above it, but with setae projecting from beneath it at the sides and along the posterior margin. Postnotum with a small cluster of minute setae. Legs, for the most part, blue black, whitish blue beneath, iridescent; the middle pair may have the apical two or three segments predominately white scaled, at least on the outer face. Wings uniformly deep bluish-brown scaled.

**MALE.**—Similar in size, color, and structure to female. The palps are short and abortive as in female. The male genitalia, fig. 46, have a long slender basistyle and are distinguished from those of all other Illinois mosquitoes by the curious processes of the dististyle.

In Illinois this little mosquito is found only in the tamarack bogs of the northeastern corner of the state. The larvae live in the water contained in the pitchers of the pitcher plant, *Sarracenia purpurea* Linnaeus. The species overwinters as larvae in the pitcher plants, and the adults emerge the following summer. The females, which lay eggs in the pitchers, apparently do not bite. The adults are quite active during the day, flying around the pitcher plants. They are very difficult to follow in flight; they have an irregular and slow flight pattern that combines with the gangling legs and iridescent color to make it difficult for an observer to be sure just how far away they are. The development of the larvae is apparently very slow. In this respect the pitcher plant mosquito resembles the tree hole species.

The range of the species includes most of

the northeastern states, wherever the pitcher plant occurs. Two other species in the genus occur in southern Florida. A key to the females is given by Roth (1946).

**Illinois Records.**—CEDAR LAKE: in bog, Aug. 3-6, 1906, Shobe, 3 ♀; Aug. 6, 1906, 1 ♂; Aug. 7, 1906, 7 ♂, 22 ♀. MCHENRY: Nov. 10, 1927, in pitcher plant, H. H. Ross, 3 larvae. VOLO: in pitcher plant, July 1, 1942, Ross & Mohr, 3 larvae; July 3, 1942, Ross & Mohr, 15 larvae; July 8, 1942, Ross & Mohr, 2 ♀, 2 pupal skins; July 19, 1942, Ross & Mohr, 12 ♂, 1 ♀; Oct. 27, 1943, Ross & Sanderson, 1 ♂.

### 5. *MANSONIA* Blanchard

Modifications in the larva make this genus of unique interest. The larval air tube forms a sharp piercing structure that is inserted into the roots or underwater stems of vascular plants; it pierces the air chambers of these, and the larva draws on the air in these chambers for its respiration. Thus, the larva does not need to come to the surface for air. Otherwise the larva and the adult are very similar to those of allied mosquitoes. The eggs are laid as rafts on the surface of the water. A single species, *perturbans*, occurs in Illinois. The only other United States species are the tropical *titillans* (Walker) and *indubitans* Dyar & Shannon, which are found in southern Florida (Pratt 1945). The species *perturbans* is placed in the subgenus *Coquillettidia* Dyar.

#### 1. *Mansonia perturbans* (Walker)

**LARVA.**—Fig. 73. Head wider than long, antennae slender and long, with a fan-shaped tuft near middle; dorsum of head with many multiple tufts. Thorax and abdomen with many long setae. Eighth segment with an irregular row of scales forming the comb. Air tube, fig. 18, with a wide base, the apical sclerites long and sharp, forming a stout piercing organ. Anal segment fairly narrow, completely encircled by a sclerotized ring; anal gills pointed, shorter than segment.

**FEMALE.**—Length of wing 4.5 mm. Beak with a mixture of brown and pale scales, the latter forming an indistinct central ring. Dorsum of head and mesonotum with brown scales and hair, the mesonotal setae abundant, long and recurved. Abdomen with a mixture of pale and brownish-blue scales, the former predominating at the base of the

segment, the latter predominating at the apex. Femora and tibiae with an irregular mixture of brown and pale scales, the posterior face of femora chiefly cream scaled; tarsal segments 2-5 each having the basal half white scaled, the apex black scaled; basitarsi with a narrow basal band of white scales and an irregular central band of white scales. Wings with an indiscriminate mixture of white and brown scales, the scales all broad.

**MALE.**—In size, color, and general structure similar to female. Palps longer than beak, the apex of the second segment and the entire third and fourth segments with a ventral brush. Genitalia, fig. 43, with ninth tergite strap shaped and having a pair of conspicuous ventral lobes. Basistyle fairly stout, its mesal face with few setae and with a single long stout beaklike spine. Dististyle twisted and angulate at base, narrow, expanded, and bladelike at apex, its apical spine forming a stout sharp tip. Lobes of tenth sternite moderately long and evenly toothed. Mesosome short and stout, with a row of stout but minute dorsal teeth.

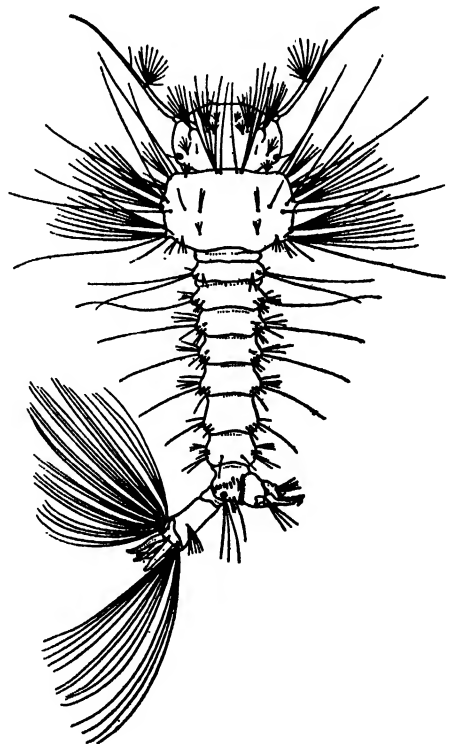


Fig. 73.—*Mansonia perturbans*, larva. (After Matheson.)



Taken in only a few areas of the state, this species is most commonly encountered in the marshes of the extreme northeastern corner and south to the Chicago area. A few other records have been taken extending to the southern third of the state. Adult records occur from June through August. Males have been taken only in the early part of this period and suggest that there is only a single generation per year in Illinois. The species is associated chiefly with cattails and aquatic sedges. In the southern states, pickerelweed, arrowhead, and other plants are frequently preferred for larval attachment.

The females are voracious biters, especially in the cloudy afternoons and the crepuscular periods.

Gerhard (1910) recorded this species as common and annoying in tracts of woodland in the Chicago region and encountered rarely on the south side of the city. Specimens from Roxana, Danville, and also Algonquin were recorded by Matheson (1930). J. Lyell Clarke has told me of occasional swarms of this species which were very annoying to the workers in several industrial plants on the south side of Chicago.

The species is widely distributed throughout the eastern United States, from Minnesota to Florida.

**Illinois Records.**—Adults, collected May 21 to September 19, are from Algonquin, Beach, Belleville (USPHS), Cahokia (USPHS), Camp Grant (USPHS), Carterville (USPHS), Danville, East St. Louis, Elsah, Grand Tower, Granite City (USPHS), Great Lakes Naval Training Station, Herrin, Johnston City (USPHS), Marion (USPHS), Oak Park, Peoria (USPHS), Pere Marquette State Park, Roxana, Savanna, Starved Rock State Park, Volo, and Zion.

## 6. *ORTHOPODOMYIA* Theobald

The Illinois species of this genus are characterized by the curious mesonotal pattern of the adults, fig. 27, and by the air tube, basal sclerite, and anal segment of the larva, fig. 17. Two species are known from Illinois, both of which occur only in tree holes. The status of these two species is very puzzling. To date no distinguishing characters have been discovered either in coloration of the external areas or in the structure of the male genitalia. The larvae, however, differ quite markedly both in color and in the average sclerotization of the seventh and eighth abdominal segments. Larvae of both

species are practically identical in chaetotaxy and formation of the lateral comb.

It has been suggested that the color of the base of the abdomen would separate these two forms in the adult stage. Isolated rearings have demonstrated that this difference does not hold, at least for Illinois specimens. It is therefore impossible at present to give a key for the specific diagnosis of males or females.

### KEY TO LARVAE

- Head medium to dark brown, body pink; segments 6, 7, and 8 usually with dorsal sclerotized plates, the plate of segment 8 frequently extending ventrad to the ventral margin of the comb, fig. 17; these sclerotized plates may be entirely absent. . . . . 1. *signifera*  
Head capsule very pale yellow to white, body white to straw color; segments 6, 7, and 8 without sclerotized plates. . . . . 2. *alba*

### 1. *Orthopodomyia signifera* (Coquillett)

**LARVA.**—Fig. 17. Length 7 mm. Head dark brown, somewhat oval, slightly longer than wide; upper and lower head hairs multiple and fan shaped, the lower hairs close to the uppers and more laterad than anteriorly; between them is a pair of shorter fanlike tufts. Thorax and abdomen with many long hairs. Seventh abdominal segment frequently with a large dorsal sclerotized shield, which may be reduced to a pair of small dorsal sclerites or even be entirely absent. Eighth segment usually with a large dorsal sclerotized shield; this may be so large that it extends to the ventral end of the lateral comb but it may be much smaller or in rare individuals practically absent. Lateral comb consisting of two distinct series of scales, an anterior row of 15 to 20 small scales and a posterior row of about 5 very large long scales. Air tube about three times as long as wide, having no pecten but having a large ventral tuft just before middle. Anal segment with a basal barlike sclerite, the main portion of the segment completely surrounded by the sclerotized ring and with pointed gills, the upper pair much longer than the segment, the lower pair about as long as the segment.

**FEMALE.**—Length of wing 4 mm. Entire body principally dark brown to black scaled, dull and velvety. Beak and palps with irregular rows of white scales, dorsum of head

with scattered white scales and a prominent row around posterior margin of eyes. Mesonotum with narrow but sharp lines of white scales, fig. 27. First abdominal tergite and base of second usually white scaled. Femora with a scattering of white scales, tibiae with irregular lines of white scales. Tarsi black, the anterior pair with a minute white patch at end of basitarsus, the middle pair with patches of white at base of apex. Basitarsus and the hind pair with basal apical patches on the first four tarsal segments and on the dorsum of the last segment. The white bands on only the first two tarsal segments of the hind legs are wide enough to form conspicuous bands. Wings with a conspicuous mottling of white scales that form definite patches on the base of the anal vein and around the point where  $R_{4+5}$  and  $R_{5+6}$  divide from each other.

MALE.—Size, color, and general structure essentially as for female. Palps elongate, as long as beak, black scaled, without tufts, but apical segment with 15 or 20 fairly long stiff setae projecting irregularly on all sides. Male genitalia as in fig. 45. Ninth tergite mostly membranous, without definite ventral lobes. Tenth sternite of medium length, ending in a series of three or four closely appressed teeth. Mesosome about as long as tenth sternite, with short lateral teeth near apex. Basistyle elongate, with a ventral mesal cluster of stout setae; at its base is a mesal arcuate lobe that bears an even cluster of stout setae. Dististyle slender and elongate, tipped with a short stout seta that is truncate at apex, the end apparently with a cone-shaped hollow.

Widely distributed over Illinois, this species breeds exclusively in tree holes. The eggs are laid singly at the water's edge and hatch in a few days. As seems true with all the tree hole mosquitoes occurring in this latitude, the larvae apparently grow rather slowly. Emergence of adults begins toward the end of June and continues through the summer. Apparently females of the species bite humans only on rare occasions and are not a pest. Superficially the adult resembles the yellow-fever mosquito, *Aedes aegypti*. The adults can usually be found most readily sitting in and around tree cavities.

The species is widely distributed throughout many of the eastern states, although it does not occur much farther north than Illinois.

To date, all but one of the larval colonies of this genus that we have encountered in Illinois have been those of *signifera*. For this reason we have tentatively considered all field-collected adults of *Orthopodomyia* to be of this species.

This species was reported from the Chicago area by Gerhard (1910) as *Bancroftia signifera* and from Urbana by Matheson (1930).

Illinois Records.—Larvae, collected June 29 to July 3, and adults, collected June 5 to September 30, are from Cahokia (USPHS), Des Plaines, East St. Louis, Galesburg, Glencoe, Havana, Mahomet, Onarga, Ridge Lake, Scott Field (USPHS), Thebes, and Urbana.

## 2. *Orthopodomyia alba* Baker

Similar to *signifera* in adult characters and in general characteristics of the larva; differing as outlined in the key. Only a single colony of this species has been encountered in Illinois. It was found in a tree hole—in a soft maple tree at Onarga, where it occurred with *signifera*. This dual colony has persisted for several years, the *alba* larvae slightly more abundant than the *signifera* larvae. Individual rearings from this colony established the similarity in color of the adults of the two forms.

## 7. *CULISETA* Felt

Only two species of this genus have been taken in the state. A third species, *melanura* (Coquillett), is widespread to the east and south. The few remaining species of the genus are northern or western in distribution. The eggs are laid in rafts on the surface of the water. The adults resemble large specimens of *Culex*, but the larvae are readily distinguished from other mosquito larvae by the large basal tuft on the air tube.

### KEY TO SPECIES

#### LARVAE

- Tube short and stout, fig. 74. . . . .1. *inornata*  
Tube longer and slender, fig. 75. . . . .2. *morsitans*

#### FEMALES

- Tarsi without pale rings on the segments. . . . .1. *inornata*  
Tarsi with faint whitish rings at both ends of the segments. . . . .2. *morsitans*

#### MALES

- Mesosome consisting of a pair of long, slender black rods tipped with a small membranous piece, fig. 78. . . . .1. *inornata*

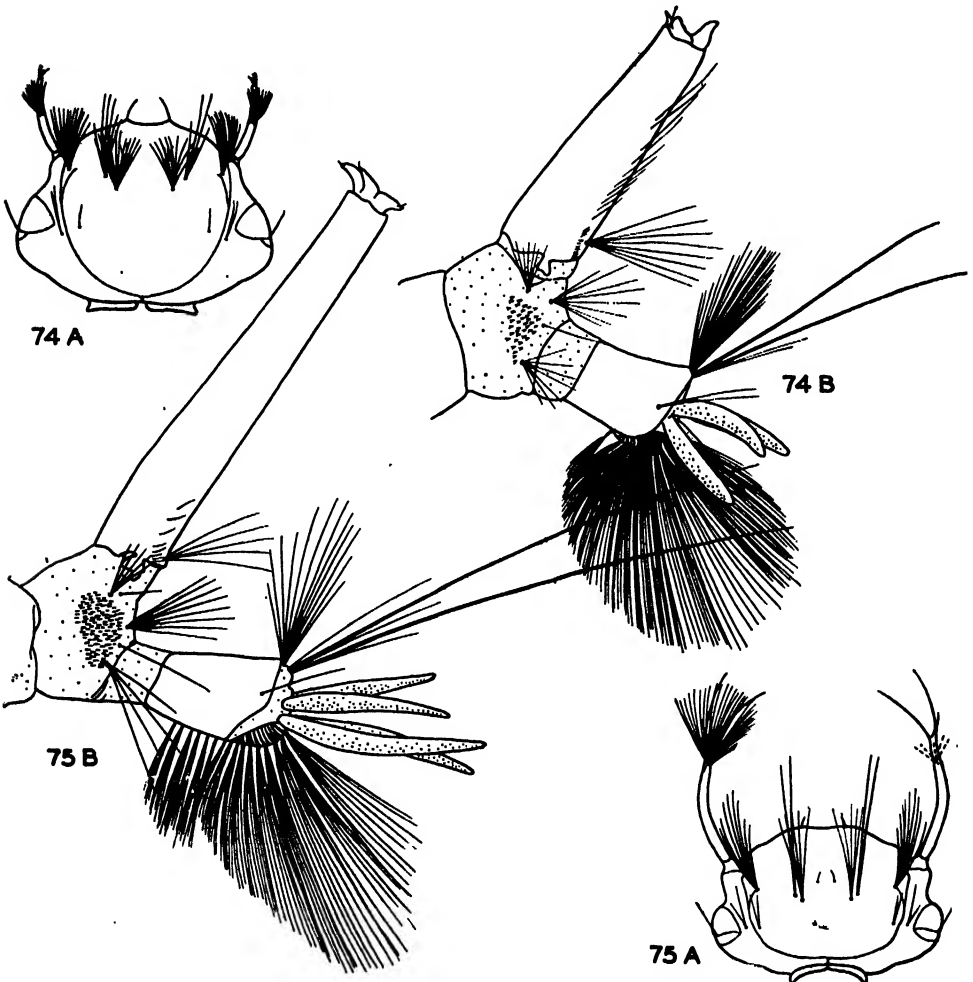
Mesosome wide, bulbous in central portion and only lightly sclerotized, fig. 77.....  
.....2. *morsitans*

1. *Culiseta inornata* (Williston)

LARVA.—Fig. 74. Length 10 mm. Head capsule wider than long, upper and lower head hairs fan shaped, the lower ones usually quadruple, the upper ones with about eight rays; in front of the upper hairs is an accessory pair of tufts, each with about four hairs. Hairs of thorax and abdomen of only medium length. Eighth segment with a triangular comb consisting of about 50 scales. Air tube fairly long, a little over three times

as long as wide; pecten long, the basal 10 to 12 scales sclerotized and dark, the remainder longer, hairlike, and almost colorless; ventral tuft composed of about eight long stout hairs situated near the base of the air tube on the ventral aspect mesad of the pecten. Anal segment completely encircled by sclerotized ring; anal gills long and tapering, longer than segment.

FEMALE.—Wing length 6 mm. Beak, head, mesonotum, and most of legs a mixture of brown and gray scales; pleurae, venter of abdomen, and ventral face of most of legs with gray or cream-colored scales predominating. Dorsum of abdomen with basal bands of cream and tawny scales, apical



Larvae of *Culiseta*

Fig. 74.—*C. inornata*: A, dorsum of head; B, apex of abdomen.

Fig. 75.—*C. morsitans*: A, dorsum of head; B, apex of abdomen.

portion brown scaled. Wings mostly brown scaled but with a mixture of tawny scales along most of the anterior veins. In some specimens Costa and Radius almost entirely tawny scaled; in these the legs may be predominantly tawny scaled throughout.

**MALE.**—Form slender compared to that of female. Pattern in general similar to

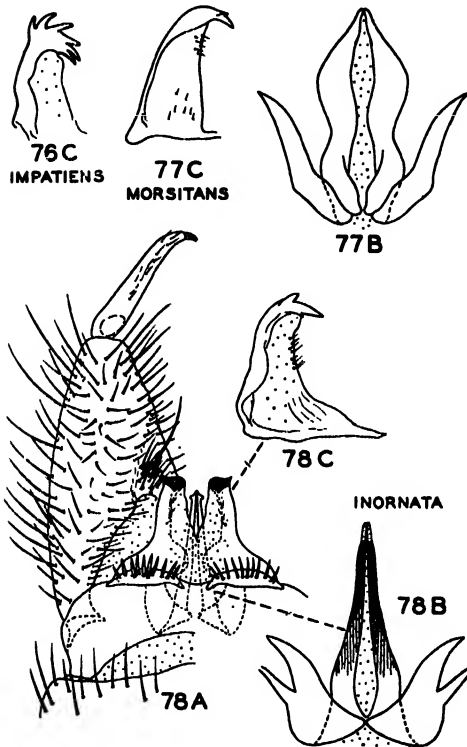
composed of two long sclerotized plates with a slender membranous tip.

One of the common marsh mosquitoes in Illinois, this species is most abundant in the northeastern quarter of the state, where it is found in numbers in almost every marsh. Farther south it occurs in marshes, sink holes, stump holes, and artificial ponds. In Illinois the species apparently has an early spring and late summer generation with a fairly definite period of inactivity during the hottest period of the summer. The two-brooded condition is especially pronounced in southern Illinois, where the first wave of adults comes out in April and early May and the next in September and October. The eggs are laid as rafts on the surface of the water. The adults apparently overwinter and are frequently encountered entering houses, presumably to hibernate, during warm days of November and December. In early spring the overwintered females bite ferociously, but during the summer this species does not seem to constitute much of a pest even in those regions where it is abundant.

Very common throughout almost the entire United States, the species is essentially a winter form in the extreme southeast, according to King, Bradley, & McNeel (1939); in higher elevations of the Rocky Mountains it is primarily a midsummer form. Illinois presents an interesting intermediate between these two extremes.

The species was recorded from the vicinity of Chicago under the name *Culiseta consobrinus* (Robineau-Desvoidy) by Gerhard (1910). Matheson (1930), who recorded it as common and widespread in Illinois, listed several localities. In the same paper he listed a male from Carbondale, Illinois, as *Theobaldia impatiens* (Walker); the cleared genitalia of this specimen show that it is a typical specimen of *Culiseta inornata*.

**Illinois Records.**—Larvae, collected April 6 to October 22, and adults, collected March 16 to November 16, are from Algonquin, Alton, Amboy, Antioch, Cache, Cahokia (USPHS), Cairo (USPHS), Camp Grant (USPHS), Carbondale, Carterville (USPHS), Cottage Grove, Crab Orchard Lake (USPHS), Dupo, Durand, East Moline (USPHS), East Peoria (USPHS), East St. Louis, Effingham, Eldorado, Elk Grove, Elsau, Farmer City, George Field (USPHS), Gilman, Glencoe, Grand Tower, Granite City (USPHS), Grantsburg, Great Lakes Naval Training Station, Harrisburg, Havana, Hazelcrest, Herod, Herrin, Highland, Hinsdale, Kan-



Figs. 76–78.—Male genitalia of *Culiseta*. A, genital capsule, ventral aspect; B, mesosome, dorsal aspect; C, lobe of tenth sternite, lateral aspect.

that of female but with the cream and tawny scales replaced almost entirely by lemon scales, with little or no banding on the dorsum of the abdomen but with the eighth tergite almost entirely yellow scaled. Palps longer than beak, slender, and without conspicuous brushes, both palps and beak largely yellow scaled, except at tip. Genitalia, fig. 78, with basistyle fairly long, robust, and tapering, with a small meso-basal area bearing a dense patch of setae. Dististyle slender, tipped with a pair of short stout tooth-like setae. Lobes of tenth sternite ending in a few sharp teeth, much fewer than in *impatiens* (Walker), fig. 76. Mesosome

kakee, Karnak, Keithsburg, Makanda, Marion (USPHS), McLean, Mazon, Mill Shoals, Mississippi Palisades State Park, Momence, Mount Vernon, Mount Zion, Muncie, Neoga, New Boston, Orland Park, Palatine, Palos Park, Pere Marquette State Park, Ravinia, Rockton, Roxana, St. Jacob, Savanna (USPHS), Scott Field (USPHS), Seneca (USPHS), Springfield (USPHS), Starved Rock State Park, Urbana, Wadsworth, Waltersburg, Ware, Waukegan, White Heath, Willow Springs, Wolf Lake, Woodstock, and Zion.

## 2. *Culiseta morsitans* (Theobald)

**LARVA.**—Fig. 75. Length 9 mm. Head very wide, almost rectangular. Upper head hairs usually four or five branched, lower head hairs double and extremely long; between them is a pair of extremely minute hairs. Antennae long and curved with a large tuft near apex. Thorax and abdomen with many very long hairs. Eighth segment with large triangular lateral comb consisting of about a hundred minute scales. Air tube extremely long and slender, nearly seven times as long as wide; pecten consisting of only a few flat teeth on basal fourth; ventral tuft on ventral margin at extreme base. Anal segment entirely enclosed by sclerotized ring, with hairs of ventral brush arising through ring; anal gills slender and pointed, about as long as segment.

**FEMALE.**—Length of wing 5 mm. Color dark bluish brown, the dorsum of head mostly gray scaled, mesonotum with a few small spots and lines of gray scales. Dorsum of abdomen with a basal gray band on each segment, the apical portion of the segments brown scaled. Legs almost entirely bluish-brown scaled with faint but distinct narrow rings at the base of most of the tarsal segments. Wings entirely blue-brown scaled.

**MALE.**—Similar in size and color to female. Palps elongate, differing markedly from those of *inornata* in having long ventral brushes at the apex of the second and on all of the third and fourth segments. Genitalia similar in general outline to those of *inornata*, differing markedly in the shape of the mesosome, which is bulbous, sinuate, and not heavily sclerotized, fig. 77.

This is a northern species, which we have taken in Illinois only in a tamarack bog near Antioch. A single larva was taken on the edge of the bog, June 4, 1943, Ross & Sanderson; subsequent collecting during the same year failed to disclose additional

specimens. The next year the bog was visited on April 19, and scattered specimens of the larva were found in the cool, shaded pools around the base of the old tamarack hummocks. Efforts to rear some of these specimens were not successful. The specimens were transported to Urbana, where at the time fairly high temperatures prevailed, and all the larvae died. It is interesting to note that larvae of several species of *Aedes*, brought back at the same time and given the same treatment, emerged without difficulty. On a subsequent visit to the bog on May 19, 1944, larvae were found in the same place and apparently completely full grown. On this occasion, jars in which larvae were placed were wrapped in moist cloths for the trip to Urbana and afterwards were kept in a water bath at a temperature of about 60 degrees F. These larvae matured and transformed slowly but successfully.

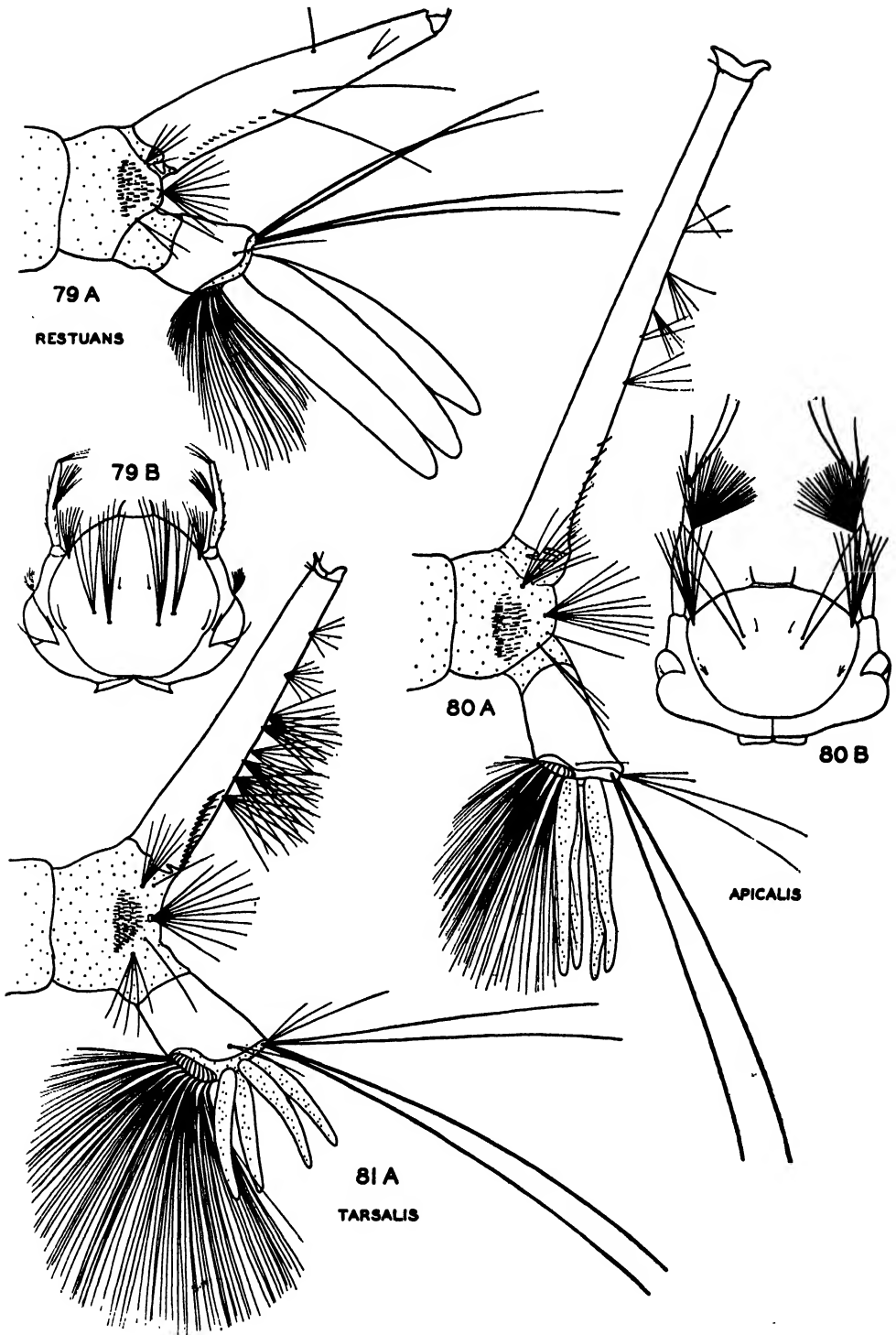
Although no other records for Illinois have been taken, we have in the collection a female from Lake Delavan, Wisconsin, and two females from Minocqua, Wisconsin, which are of this same species; these were incorrectly recorded as *impatiens* (Walker) by Matheson (1930).

## 8. *CULEX* Linnaeus

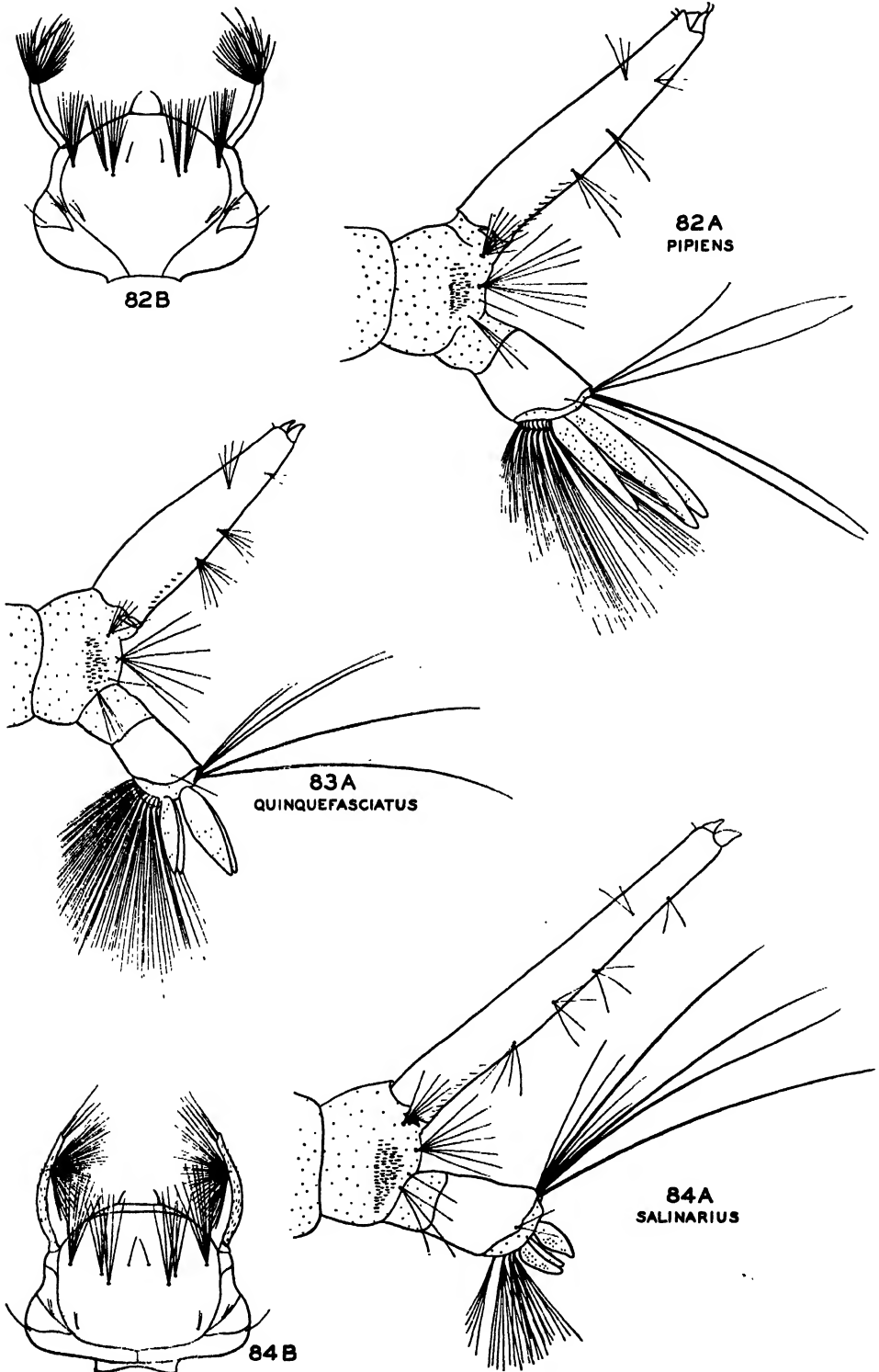
The eight species of this genus that occur in Illinois have a continual series of generations throughout the warmer months of the year. The females lay their eggs in rafts on the surface of the water. The species frequent still or semistagnant water of all types and may be found even in lakes of some size, the larvae breeding in masses of floating or emergent vegetation. Usually the larvae are taken in association with anopheline larvae.

The genus as a whole is tropical or subtropical in distribution. Many North American species occur in the southeastern states, southwest Texas, and southern California. In the Neotropical region, the genus is represented by a very large number of species.

During the period 1941–1945 concerted investigations of the mosquito fauna of the southern areas of the United States led to the discovery of several species of *Culex* hitherto recorded only from the Neotropical region. A digest of these and allied Nearctic species is given in two papers, one by W. W. Wirth (1945) and the other by



Figs. 79-81.—Larvae of *Culex*. *A*, apex of abdomen, lateral aspect; *B*, dorsum of head. In figs. 81 and 85, the ventral tufts are shown for both sides of the air tube. In other illustrations, tufts of only one side are shown.



**Fig. 82-84.**—Larvae of *Culex*. *A*, apex of abdomen, lateral aspect; *B*, dorsum of head.

Pratt, Wirth & Denning (1945). These papers supplement the work of Roth (1943) on the Nearctic species of *Culex*.

The genus is divided into many subgenera, three of which are represented in Illinois.

KEY TO SPECIES

LARVAE

1. Antennal tuft near middle, fig. 79.....  
.....2. *restuans*
- Antennal tuft considerably beyond middle,  
fig. 80.....2

- Comb scales forming a patch; body only sparsely spiculose; upper head hairs double or triple.....8. *peccator*
5. Air tube very long and slender, fig. 84, from six to eight times as long as width at end of pecten; tufts scattered and weak.....5. *salinarius*
- Air tube either not more than five times as long as wide, fig. 82; or with strong, clustered tufts, fig. 81.....6
6. Air tube usually six times as long as width at end of pecten, sinuate but of almost uniform thickness throughout, and with

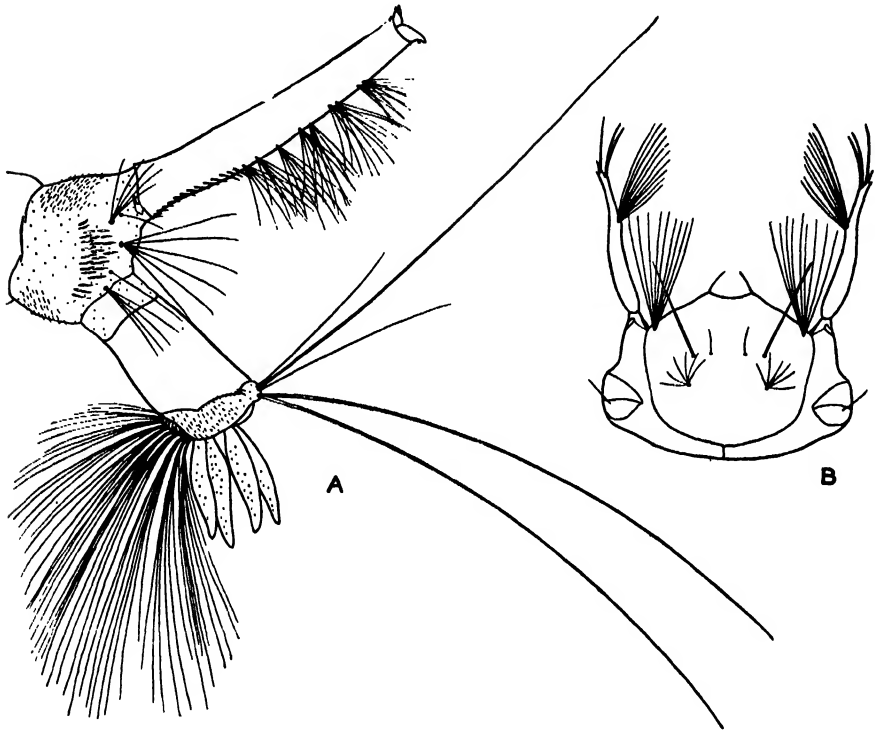


Fig. 85.—*Culex erraticus*, larva. A, apex of abdomen; B, dorsum of head.

2. Both pairs of head hairs long and single, an occasional hair double, fig. 80.....  
.....1. *apicalis*
- One or both pairs of head hairs either multiple, fig. 82, or very short, fig. 85.....3
3. Lower head hairs long and single, upper short and double to multiple, fig. 85...4
- Lower head hairs triple to multiple, similar to upper head hairs, both pairs long, fig. 82.....5
4. Comb scales arranged in an irregular single or double row; body densely spiculo-pilose; upper head hairs each with four or more branches; fig. 85...  
.....7. *erraticus*

- all tufts near ventral margin, fig. 81...  
.....6. *tarsalis*
- Air tube usually three and one-half to five times as long as width at end of pecten, somewhat vasiform, definitely thickest near end of pecten; penultimate tuft distinctly more dorsal than, and out of line with, the others, fig. 82.....7
7. Air tube usually four to five times as long as wide; two basal pairs of hair tufts with a maximum of three or four branches each, fig. 82.....3. *pipiens*
- Air tube usually less than four times as long as wide, two basal pairs of hair tufts with 5 to 10 branches each, fig. 83  
.....4. *quinquefasciatus*



FEMALES

1. Beak and hind tarsi with white bands; mesonotum with white lines, fig. 86A . . . . . 6. *tarsalis*  
Beak and hind tarsi entirely dark; mesonotum with pale dots but without white lines on central portion . . . . . 2
2. Dorsum of abdomen with apical white bands or apical lateral spots on some of the segments, and without basal bands. . . . . 1. *apicalis*  
Dorsum of abdomen with basal bands but no apical bands . . . . . 3

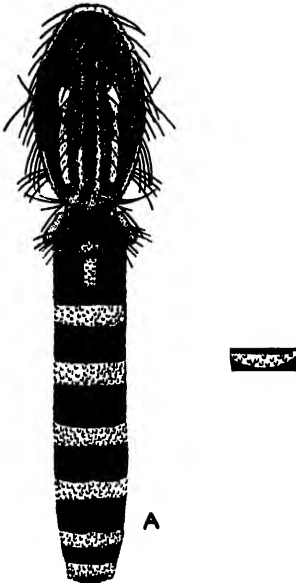


Fig. 86.—Dorsum of *Culex* females. A, *C. tarsalis*, thorax and abdomen; B, *C. pipiens*, abdomen; C, *C. quinquefasciatus*, abdomen.

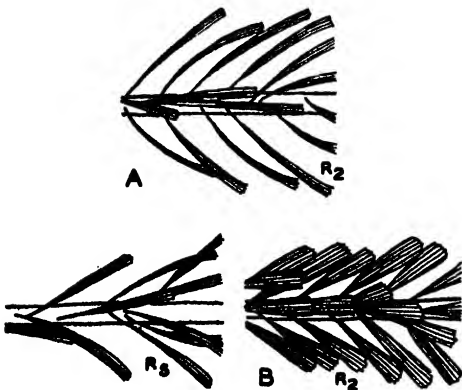
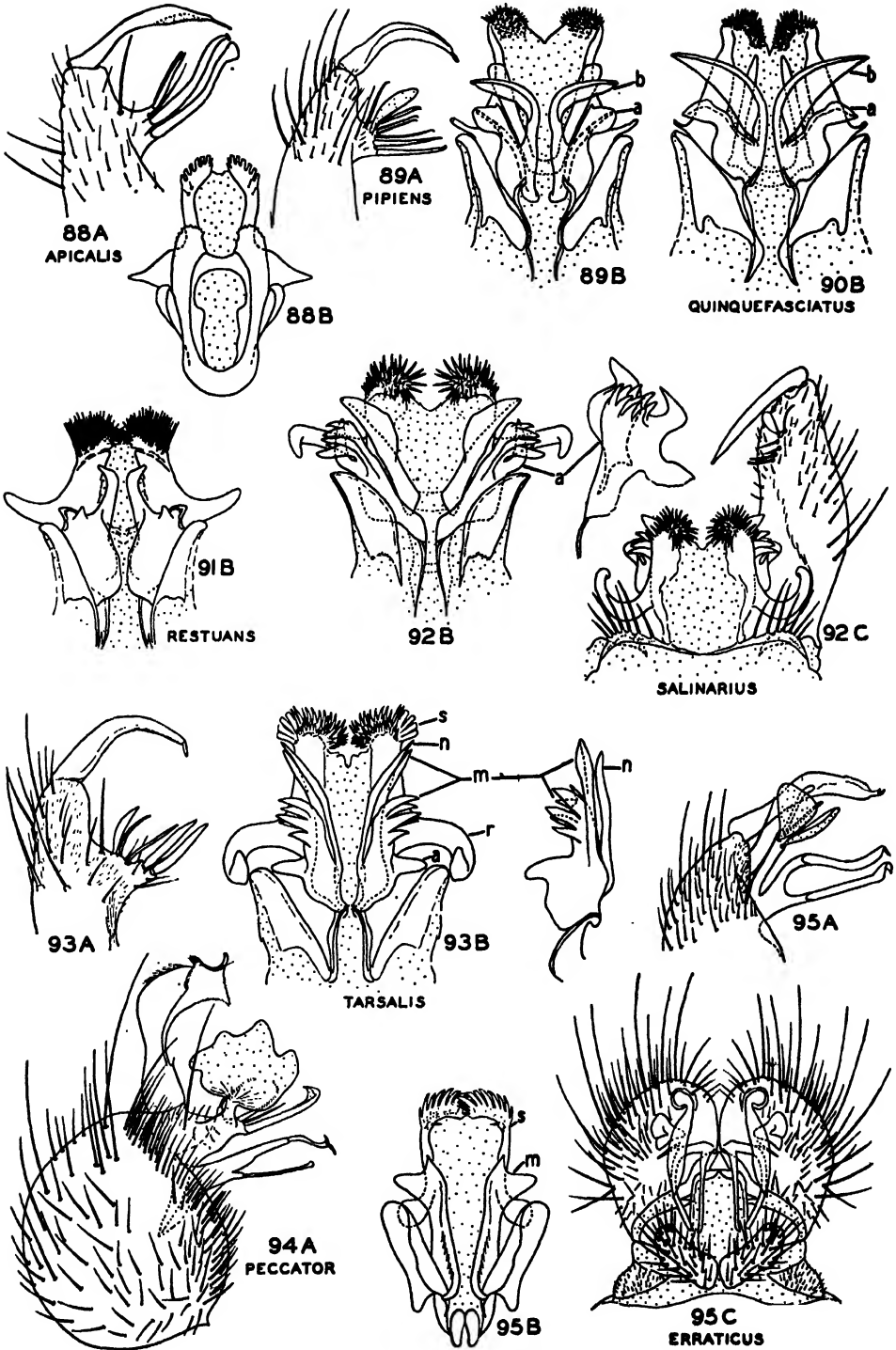


Fig. 87.—A, *Culex restuans*, scales on wing vein R<sub>2</sub>; B, *C. erraticus*, scales on wing vein R<sub>2</sub> and R<sub>5</sub>.

3. Scales of veins R<sub>2</sub> and R<sub>5</sub> very long and slender, fig. 87A, similar to scales on stem of R<sub>4</sub> (examination of wing mount under a compound microscope is best method for seeing this character) . . . . . 4  
Scales of veins R<sub>2</sub> and R<sub>5</sub> shorter and wide, fig. 87B, contrasting with long, slender scales on stem of R<sub>4</sub> . . . . . 7
4. Abdominal tergites with dingy basal bands of yellowish or brownish scales, the bands usually irregular and narrow . . . . . 5. *salinarius*  
Abdominal tergites with bright and conspicuous basal bands of white scales, the central bands wide, fig. 86B, C . . . . . 5
5. Abdominal dorsal white bands usually deep and crescentic, the bands not extending to edge of dorsum, fig. 86C . . . . . 4. *quinquefasciatus*  
Abdominal dorsal white bands usually shallower, fig. 86B, or with posterior margin straight, extending to edge of dorsum . . . . . 6
6. Mesonotum usually with a pair of central pale spots . . . . . 2. *restuans*  
Mesonotum always without any pale spots . . . . . 3. *pipiens*
7. Occiput with a large mesal triangle of narrow scales, the area between this triangle and eyes covered with wide, overlapping scales . . . . . 7. *erraticus*  
Occiput entirely covered with wide overlapping scales except occasionally for a narrow mesal line of narrow scales . . . . . 8. *peccator*

MALES

1. Basistyle globular and short; subapical lobe divided into two or three individual long stalks, figs. 94, 95 . . . . . 2  
Basistyle elongate, tapering at apex; subapical lobe only slightly, if at all, subdivided, figs. 88–93 . . . . . 3
2. Dististyle narrow and only slightly curved; subapical lobe with upper stalk slender, leaflet regular in shape and of moderate size, fig. 95 . . . . . 7. *erraticus*  
Dististyle wide, abruptly angled just beyond middle; subapical lobe with upper stalk stout, leaflet very large and with irregular outline, fig. 94 . . . . . 8. *peccator*
3. Middle mesosomal plates armed with a cluster of stout sclerotized teeth, figs. 92, 93 . . . . . 4  
Middle mesosomal plates not toothed, in some species not evident, figs. 88–91 . . . . . 5
4. Inner mesosomal plates with apical half expanded; middle plates with basal projection, a, curved back and up under teeth, fig. 92, and without a ventral blade paralleling inner plates . . . . . 5. *salinarius*



Figs. 88-95.—*Culex*, male genitalia. *A*, claspers, lateral aspect; *B*, mesosomal structures, dorsal aspect; *C*, ventral view of capsule. Abbreviations: *s*, apex of tenth sternite; *r*, basal arm of tenth sternite; *m*, middle and, *n*, inner mesosomal plates; *a* and *b*, as in text.

- Inner mesosomal plates narrow and blade-like, apex curved laterad and paralleled by a ventral blade of middle plates; middle plates with basal projection, *a*, projecting only laterad, fig. 93.....6. *tarsalis*
5. Inner mesosomal plates forming a V- or U-shaped structure, middle mesosomal plates also well developed, terminating in a sickle-shaped process, figs. 89, 90.....6
- Inner and middle mesosomal plates not separate from each other, together represented by a single structure, figs. 88, 91.....7
6. Rods of inner mesosomal plates divergent, forming a V-shaped structure, fig. 89.....3. *pipiens*
- Rods of inner mesosomal plates convergent, forming a U-shaped structure, fig. 90.....4. *quinquefasciatus*
7. Inner mesosomal plates with apexes forming a pair of stout rods curved laterad at apex, fig. 91; brush of tenth sternite bushy.....2. *restuans*
- Inner mesosomal plates with apexes forming a pair of round serrate lobes; the entire structure forms a sclerotized oval; brush of tenth sternite comblike, fig. 88.....1. *apicalis*

### Subgenus *Neoculex* Dyar

This subgenus is characterized by the apical abdominal bands on the abdomen. The male genitalia have the basistyles elongate, and the middle and inner mesosomal plates are represented by a single structure, fig. 88.

#### 1. *Culex apicalis* Adams

**LARVA.**—Fig. 80. Head broad and short, antennae long, with long apical setae and a large tuft situated close to the apex. Upper and lower head hairs single and very long. Eighth segment with a triangular comb of about 50 scales. Air tube long and slender, at least 10 times as long as width near the middle of pecten; pecten composed of 13 or more weak scales, beyond which are six or seven ventral tufts.

**FEMALE.**—Length of wing 2.5 mm. Head and thorax almost entirely light brown. Abdomen dark bluish brown with, usually, a narrow band of white scales along the apical margin of each segment; these bands may be interrupted in the middle of the segments, or completely absent on the basal four or five segments, but are always dis-

tinct on the sixth. Legs with tibiae and tarsi entirely bluish brown, femora chiefly cream color with dark scaling on the upper surface. Wings entirely bluish-brown scaled.

**MALE.**—Similar to female. Palps long and with an extensive apical brush. Male genitalia as in fig. 88. Basistyle slender, with a distinct subapical lobe bearing a pair of long sinuate narrow processes and a pair of shorter spurs. Tenth sternite with an apical row of truncate comblike setae. Middle and inner mesosomal plates apparently fused to form a heavily sclerotized oval structure beyond which project serrate edges of the ends of the middle plates.

Of the Illinois species of *Culex*, this is the earliest. The larvae are to be found soon after the early spring *Aedes* emerge; in southern Illinois in the latter part of April, in northern Illinois in early June. Apparently a cold water form, the species practically disappears during the hot summer weeks but reappears during the cooler weeks of late summer and early autumn. The larvae show a decided preference for open marshes or moderately shaded pools with clear water. The species is found throughout Illinois and has a wide distribution over most of North America. It is seldom noxious to man.

**Illinois Records.**—Larvae, collected April 17 to October 17, and adults, collected April 28 to October 6, are from Albion, Algonquin, Alma, Belleville (USPHS), Cache, Cairo (USPHS), Calvin, Camp Ellis (USPHS), Camp Grant (USPHS), Carbondale, Carterville (USPHS), Central City, Chauute Field (USPHS), Clinton, Cottage Grove, Crab Orchard Lake (USPHS), Dixon Springs, Downs, Dupo, Durand, East St. Louis, East Dubuque, Edwardsville, Effingham, Eichorn, Elsah, Epworth, Giant City State Park, Gorham, Gossett, Grafton (USPHS), Grand Tower, Granite City (USPHS), Grantsburg, Great Lakes Naval Training Station, Halfday, Herod, Herrin, Joetta, Johnston City (USPHS), Kappa, Karnak, Keithsburg, Lake Villa, Lake Zurich, La Rue, Lawrenceville (USPHS), Marion, Michael, Mill Shoals, Morris, Mount Carmel, Mount Vernon (USPHS), Mulberry Grove, Muncie, New Boston, New Haven, Oakwood, Olney, Omaha, Palos Park, Pere Marquette State Park, Princeton, Raymond, Rockville, Rockwood, Rosecrans, St. Jacob, St. Joseph, Savanna, Scott Field (USPHS), Seneca (USPHS), Shawneetown, Springfield, Starved Rock State Park, Sugar Grove, Thomson, Urbana, Utica, Vienna, Volo, Wadsworth, Waltersburg, Ware, Wauconda, West Vienna, White Heath, Willow Springs, Yellow Springs, and Zion.

### Subgenus *Culex* Linnaeus

In this subgenus the scales on vein  $R_2$  and  $R_3$  are slender and elongate, similar to the scales on the stem of  $R_2$  and  $R_{3+4}$ , fig. 87*A*. In the males, the genitalia usually have the basistyle elongate and the middle and inner mesosomal plates differentiated as two pairs of processes.

### 2. *Culex restuans* Theobald

**LARVA.**—Fig. 79. Head moderately long. Antennae shorter than head, each antenna having short apical spines and a short tuft situated near middle. Preantennal tuft short and multiple. Upper and lower head hairs multiple and long. Eighth segment with triangular comb of about 30 or 40 scales. Air tube elongate, nearly five times as long as greatest width, slightly enlarged near middle and tapering to apex; pecten composed of 10 or more weak scales, beyond which there are two long setae and a short tuft on each side.

**FEMALE.**—Length of wing 4 mm. Head and mesonotum bright brown. Mesonotum usually having an indistinct band of cream scales around anterior and lateral portions and around scutellum; usually with a pair of spots of cream color about the middle of the sclerite. Dorsum of abdomen bluish brown, each segment with a basal bright cream band which has a nearly straight posterior margin. Legs with tibiae and tarsi entirely dark, femora cream, frequently with upper and outer areas dark. Wings entirely dark scaled.

**MALE.**—Similar in size, structure, and general color to female. Palps elongate, with an extensive apical brush. Male genitalia, fig. 91, similar in shape of basistyle, subapical lobe, and dististyle to those of *picipiens*, fig. 89*A*. Tenth sternite with a dense brush of narrow setae and with a moderately developed basal arm. Middle and inner mesosomal plates apparently fused, each side with a broad base, with one or two lateral bumps, and with a long apical process curved sharply laterad at tip.

In Illinois this species is one of the most common mosquitoes in unstocked fish ponds, rain barrels, semidomestic water holes, and pools of many types, especially those with abundant humus. It is distributed over the entire state. It occurs nearly as early in the season as *apicalis* and continues breeding

throughout the summer and into early autumn. Although it has been recorded as a painful biter, some observers believe that it bites little. Judged from our own experience, this species is seldom annoying; certainly it is not such a persistent and vicious biter as *erraticus*. Widespread throughout the eastern and central states from the Atlantic seaboard to the Rocky Mountains, *restuans* extends southward to the Gulf.

**Illinois Records.**—Larvae, collected April 17 to October 14, and many males and females, collected April 19 to November 23, are from Algonquin, Alton, Anna, Aurora, Belleville (USPHS), Cahokia (USPHS), Cairo (USPHS), Calvin, Camp Ellis (USPHS), Camp Grant (USPHS), Carbondale (USPHS), Carmi, Carterville (USPHS), Chanute Field (USPHS), Charleston, Chester, Clinton, Cottage Grove, Crab Orchard Lake (USPHS), Danville (USPHS), Durand, East Peoria (USPHS), East St. Louis, Elk Grove, Epworth, Forest City, Forest Glen, Fox Lake, Galesburg (USPHS), George Field (USPHS), Gorham, Grafton (USPHS), Grand Tower, Granite City (USPHS), Great Lakes Naval Training Station, Halfday, Havana, Herrin (USPHS), Hoopeston (USPHS), Johnston City (USPHS), Kappa, Karnak, Keithsburg, Lake Villa, La Rue, Lawrenceville (USPHS), Marion (USPHS), Maroa, Milford (USPHS), Mount Vernon (USPHS), Mount Zion, Muncie, New Haven, Oakwood, Olney, Orland Park, Palos Park, Pere Marquette State Park, Pittsburg, Pittsfield, Princeton, Ravinia, Reynoldsville, Ridge Lake, Rising Sun, Riverside, Rockford, Rock Island (USPHS), Roxana, Russellville, Salem, Savanna (USPHS), Scott Field (USPHS), Seneca (USPHS), Shawneetown, Skokie, Springfield (USPHS), Starved Rock State Park, Summerdale, Urbana, Vienna, Wadsworth, Waltersburg, Ware, Waterloo, White Heath, Willow Springs, Winnetka, Wolf Lake, and Zion.

### 3. *Culex picipiens* Linnaeus

**LARVA.**—Fig. 82. Head moderately wide, with fairly long apical bristles and a thick tuft situated near apex. Upper and lower head hairs multiple, as long as, or slightly longer than, the preantennal tuft. Eighth segment with triangular comb composed of 30 or 40 small scales. Air tube nearly four and one-half times as long as its width at end of pecten; pecten composed of about 10 weak scales; between the end of the pecten and apex of tube are four tufts on each side, one of them considerably more dorsal than the others; these tufts are long and usually composed of three hairs.

**FEMALE.**—Length of wing 3.5 mm. Head dark bluish brown with scattered gray scales on dorsum. Mesonotum entirely brown. Dorsum of abdomen bluish brown, each segment with a basal band of white scales; these bands moderately narrow, usually extending the full width of the segment and having the posterior margin irregular or nearly straight across; the bands on segments 3–6 should be used as examples. Legs with tibiae and tarsi black or dark, femora cream with dorsal or outer portions dark.

**MALE.**—Size, color, and general structure as for female. Palps elongate, with an extensive apical brush. Male genitalia, fig. 89: basistyle slender, its subapical lobe prominent, with a short leaflet and several bristles and spines; dististyle slender and curved. Tenth sternite with an apical brush of fairly short pointed spines, its basal arm slender and short, sometimes poorly developed and inconspicuous. Middle mesosomal plate with two lobes, an irregular sclerotized basal lobe, *a*, and a sickle-shaped apical lobe that has a sclerotized apical edge and a membranous area below this. Inner mesosomal plate composed of a single straight blunt blade on each side, the two forming a V-shaped structure.

Known as the northern house mosquito, this species is common over all of Illinois. The larvae frequent practically all types of domestic and semidomestic pools, such as rain barrels, tar buckets, fish ponds, clogged drains, and containers of various descriptions. The adults are persistent but wary biters, especially annoying at night in gardens or houses. The species occurs throughout the season, from late spring until early autumn. In garden pools it frequently occurs in company with *restuans* and *quinquefasciatus*. It is one of the easier species to control by the use of clean-up measures directed against the semidomestic type of water containers in which this species breeds.

The northern house mosquito is widely distributed over most of the temperate regions of the world having at least moderate rainfall. In the eastern states it extends south of Illinois into the northern portion of the southern states.

**Illinois Records.**—Larvae, collected from May 3 to September 15, and many males and females, collected from May 6 to November 15, are from Algonquin, Belleville (USPHS), Cahokia (USPHS), Cairo (USPHS), Camp Ellis (USPHS), Carbondale (USPHS), Carmi, Carter-

ville (USPHS), Central City, Chanute Field (USPHS), Charleston, Chicago, Clinton, Cottage Grove, Crab Orchard Lake (USPHS), Danville (USPHS), Decatur (USPHS), Dwight, East St. Louis, Edwardsville, Elsah, Forest Glen, Galesburg (USPHS), George Field (USPHS), Gibson City (USPHS), Grafton (USPHS), Granite City (USPHS), Great Lakes Naval Training Station, Havana, Herrin, Hoopston (USPHS), Johnston City (USPHS), Lawrenceville (USPHS), Marion, Metropolis, Mound City, Mounds, Mount Carmel, Mount Vernon (USPHS), Palos Park, Peoria (USPHS), Ravinia, Raymond, Rockford (USPHS), Rock Island (USPHS), St. Jacob, St. Joseph, Savanna (USPHS), Scott Field (USPHS), Seneca (USPHS), Springfield (USPHS), Urbana, Vienna, Ware, Willow Springs, and Zion.

#### 4. *Culex quinquefasciatus* Say

**LARVA.**—Fig. 83. Very similar in size, shape, and general structure to larva of *pipiens*. There is often considerable difficulty in separating specimens of the two species. Material of *quinquefasciatus* collected in Illinois is distinguished by the following combination of characters: air tube only about three and one-half times as long as its width at end of pecten; tufts on air tube usually with four or more branches and usually markedly shorter than greatest width of air tube. The gills of both species vary in length.

**ADULTS.**—Similar in almost all respects to *pipiens* adults. The female usually has definite-shaped basal bands on the abdominal tergites; in *quinquefasciatus* the bands are deeper than in *pipiens* and taper off completely at the edge of the dorsal aspect. Female specimens are encountered, however, in which it is difficult to distinguish between the two species either on this character or any other. The male genitalia are very similar to those of *pipiens* in general conformation. Those of *quinquefasciatus* are distinguished as follows, fig. 90: the distal lobe, *b*, of the middle mesosomal plates is larger and extends farther laterad than in *pipiens*; and the arms of the inner mesosomal plates make a U-shaped structure with converging arms (diverging arms in *pipiens*).

*Culex quinquefasciatus*, the southern house mosquito, occurs regularly in the southern third of the state but has been taken only sporadically northward. Light trap collections indicate that this species does not appear in numbers until July or August and usually disappears soon after the first

cool weather in September. The larvae frequent the same types of domestic and semidomestic containers as those of *pipiens* and the two species are usually represented in mixed cultures in Illinois. *C. quinquefasciatus* is distributed throughout most of the tropical and subtropical regions of the world. The Illinois records appear to be on the extreme northern edge of its North American range, which extends southward to the Gulf of Mexico.

In much of the literature, this species has been recorded under the name *fatigans* Wiedemann. Edwards (1932) prefers to refer *quinquefasciatus* Say to the list of dubiously known names. Since *quinquefasciatus* has been used consistently as at present, there seems no valid reason for discarding this name in favor of *fatigans*; *quinquefasciatus* was described in 1823, *fatigans* in 1828.

**Illinois Records.**—Larvae, collected from September 15 to October 1, and adults, collected from June 17 to November 23, are from Belleville (USPHS), Cahokia (USPHS), Cairo (USPHS), Carterville (USPHS), East St. Louis, Edwardsville, Grafton (USPHS), Granite City (USPHS), Herrin (USPHS), Johnston City (USPHS), Marion (USPHS), Mount Vernon (USPHS), Scott Field (USPHS), and Urbana.

### 5. *Culex salinarius* Coquillett

**LARVA.**—Fig. 84. Head moderately wide, antennae of moderate length, with long apical bristles and a stout tuft near apex. Upper and lower head hairs long, with at least four branches. Eighth segment with a triangular comb of about 50 small scales. Air tube very long and slender, about eight times as long as greatest width, pecten composed of about 10 weak scales and with several pairs of tufts irregularly placed between end of pecten and apex of tube.

**FEMALE.**—Length of wing 4 mm. Head and mesonotum bright brown, dorsum of abdomen bluish brown with narrow basal bands yellowish scaled on each segment, the bands frequently indistinct on the basal two or three segments and frequently broken up with brownish scales, giving them a muddy appearance. Legs with tibiae and tarsi entirely dark, femora mostly yellowish with upper and outer surfaces frequently dark. Wings entirely dark-brown scaled.

**MALE.**—Similar in size, color, and general structure to female. Palps long, having

extensive apical brushes. Genitalia, fig. 92: basistyle long and slender, its subapical lobe with a leaflet and several bristles and spines. Tenth sternite with a dense irregular apical brush and with a long stout basal arm. Middle mesosomal plates with a dorsal cluster of 8 or 10 stout teeth and a sharp upturned stout ventral arm. Inner mesosomal plates divergent, their apices expanded and sinuate.

Although the species occurs generally throughout Illinois, individuals are present usually only in small numbers. Breeding commences fairly early in the season and continues at a fairly uniform rate throughout the summer and into the autumn. The larvae have been taken in a variety of habitats including swampy edges of lakes, oxbow pools, marshes of various types, ponds and cattle tracks, cattail bogs, stump holes, and polluted ditches. The females are said to bite readily, but in Illinois they are not sufficiently abundant to be a nuisance.

The species breeds in the eastern United States westward into the Rocky Mountains, and south to Florida and Texas.

**Illinois Records.**—Larvae, collected April 16 to October 15, and adults, collected May 5 to November 23, are from Alton, Belleville (USPHS), Cahokia (USPHS), Cairo (USPHS), Camp Ellis (USPHS), Camp Grant (USPHS), Carbondale (USPHS), Carmi, Carterville (USPHS), Chanute Field (USPHS), Cottage Grove, Dupo, East St. Louis, Edwardsville, Equality, Fox Ridge State Park, George Field (USPHS), Gorham, Grand Tower, Grafton (USPHS), Granite City (USPHS), Great Lakes Naval Training Station, Havana, Herrin, Jacksonville, Johnston City (USPHS), Karnak, Lake Glendale, La Rue, Lawrenceville (USPHS), Marion, Maroa, Mount Vernon (USPHS), Muncie, Olney, Orland Park, Palos Park, Ridge Lake, Rock Island (USPHS), Roxana, St. Charles (USPHS), Savanna, Scott Field (USPHS), Seneca (USPHS), Springfield (USPHS), Urbana, Ware, Willow Springs, and Zion.

### 6. *Culex tarsalis* Coquillett

**LARVA.**—Fig. 81. Head moderately broad, proportioned much as in *pipiens*, fig. 82B. Antennae elongate, with long apical bristles and with a tuft near apex. Both upper and lower head hairs multiple and about as long as preantennal hair. Eighth segment with a triangular patch of about 50 small scales. Air tube slender, usually over six times as long as its width at end of pecten; pecten

composed of about 10 weak scales; beyond this are about five pairs of tufts arranged very irregularly but all near ventral margin; the basal three pairs are long and each one has three to six hairs, the apical two short and usually having two to four hairs.

**FEMALE.**—Length of wing 4.5 mm. Beak and palps dark brown; beak with a white band just beyond middle, palps with extreme apices tipped with white scales. Dorsum of head with a mixture of brown and gray scales. Mesonotum brown with narrow grayish-white lines as illustrated in fig. 86*A*. Dorsum of abdomen brown with basal patches of white scales. Legs with posterior aspects of femora and tibiae cream, anterior aspects dark brown, each with a central stripe of white scales extending down the middle of this brown area from base to apex, the white line on the anterior legs broken into a series of white bars; tarsi dark bluish brown, all segments of hind tarsi with a white ring at both base and apex of segment, tarsi of front and middle legs with white bands indistinct on, or absent from, the apical two or three segments. Wings dark scaled except for a scattering of white scales on the costal region of each.

**MALE.**—In size, color, and general structure similar to female. Palps longer than beak, apical two segments with a long brush. Genitalia, fig. 93: basistyle elongate, with a pronounced subapical lobe bearing a small leaflet, a pair of stout spurs and a pair of more slender spines. Dististyle curved and narrow. Tenth sternite with a large apical lobe, the lateral series of teeth truncate and flattened. Middle mesosomal plates with three distinct processes: (1) a large blunt basal tooth, (2) a series of five or six long large sharp teeth, and (3) a curved ventral blade that is closely appressed to the inner mesosomal plate. This last forms a long curved slender blade.

In the plains states this species occurs in very large numbers; in Illinois it has been taken in widely scattered localities over the entire state and only rarely in large numbers. The adults occur chiefly in middle and late summer, with a few persisting into early autumn. The larvae have been found in a wide variety of situations, including hoof prints, pools, stream beds, marshes, and backwaters. A colony at Cahokia, Illinois, occurred in a drainage backwater having a very high pollution by sulfuric acid waste.

The species is said to hibernate as fertilized adult females; the males apparently die at the advent of winter. Breeding begins in early spring and continues until autumn.

The range of the species includes most of the semiarid regions of the west coast and the great plains. Illinois seems to be near the eastern edge of the range. Adults of this species have been found naturally infected with the virus of western encephalomyelitis. The females, which attack men readily, are on the wing chiefly at dusk or after dark. They invade houses often and are fierce and painful biters.

**Illinois Records.**—Larvae, collected June 11 to October 15, and males and females, collected June 21 to October 28, are from Algonquin, Belleville (USPHS), Cahokia (USPHS), Camp Ellis (USPHS), Carterville (USPHS), Chanut Field (USPHS), Des Plaines, East Peoria (USPHS), East St. Louis, Edwardsville, Fox Lake, Granite City (USPHS), George Field (USPHS), Great Lakes Naval Training Station, Greenville, Havana, Hoopeston (USPHS), Johnston City (USPHS), Marion (USPHS), Milford (USPHS), Savanna (USPHS), Scott Field (USPHS), Seneca (USPHS), Springfield, Urbana, Waterloo, and Zion.

### Subgenus *Melanoconion* Theobald

This subgenus is characterized by the wide scales on veins  $R_2$  and  $R_3$ , which are in marked contrast with the long slender scales on  $R_4$ , fig. 87*B*. In the Illinois species, the males have the basistyle almost globular, and the middle and inner mesosomal plates not differentiated from each other.

### 7. *Culex erraticus* (Dyar & Knab)

**LARVA.**—Fig. 85. Head moderately wide. Antennae long, with long apical bristles and with a long tuft situated near apex, preantennal tuft long and dense, lower head hairs long, single, and bristle-like. Upper head hairs very short and multiple, with at least four and usually six hairs to each bristle. Abdomen with most of the segments spinulose, having a covering of extremely fine spinules giving it a dense, pilose appearance. Eighth segment with comb consisting of an irregular single or double row of 12 to 15 scales. Air tube only moderately long but narrow, about six times as long as its width at end of pecten; pecten composed of about 12 weak scales; beyond this are four or five

pairs of long multiple tufts situated very close to ventral margin.

**FEMALE.**—Length of wing 3.5 mm. Head, mesonotum, and dorsum of abdomen almost entirely purplish-brown scaled; abdomen usually with narrow basal bands of cream scales, usually with brown scales intermingled so that the bands are indistinct and muddy. Dorsum of head having a wide triangular mesal area with narrow scales, the area between this and the eye covered with broad overlapping scales; these are in addition to the erect scales that stand up like a comb above this area. Legs dark except for usually creamy portions of femora. Wings entirely dark scaled.

**MALE.**—Size, color, and general structure as for female. Palps long, with extensive apical brushes. Male genitalia, fig. 95: basistyle short and almost globular; apical lobe produced into three long stout stalks, the two lower ones each bearing a stout flattened process, the upper one bearing a leaflet and three spines; dististyle sinuate, with the end ridged and produced into a pair of minute teeth. Tenth tergite bearing a row of flattened teeth and a stout basal lobe of moderate length. Middle mesosomal plates bladelike and each divided at apex into a short sharp mesal point and a wider blunt lateral triangle. Inner mesosomal plates apparently not differentiated.

Abundant and widespread in southern and central Illinois, this species is a comparative rarity in the northern part of the state. The larvae frequent marshy areas at the edges of lakes, pools, and ponds in which there is abundant emergent vegetation. They are especially numerous in ponds with growth of cattails and water primrose. In addition to ponds, they frequent vegetation-choked shallows along the edges of sluggish streams and ditches. They are usually taken in company with *Anopheles*, and frequently with *Uranotaenia*, also. In Illinois, adult emergence begins in the southern part of the state, usually early in June, and continues until early autumn. The adults attack with persistence and inflict painful bites.

The species is widespread throughout the southern states. Illinois is near the northern edge of its range. It was recorded from Illinois by Matheson (1930) under the name *inhibitor* Dyar & Knab. At that time *erraticus* was generally considered a direct synonym of *inhibitor*. King & Bradley (1937) have shown, however, that *inhibita-*

*tor* and *erraticus* are distinct species. The name *inhibitor* should be applied to a Santo Domingan species, whereas *erraticus* is the name to be used for this small dark Illinois mosquito.

**Illinois Records.**—Larvae, collected from June 29 to October 3, and males and females, collected from June 2 to November 4, are from Alma, Belleville (USPHS), Benton, Cahokia (USPHS), Cairo, Carbondale, Carterville (USPHS), Charleston, Cottage Grove, Coulterville, Crab Orchard Lake (USPHS), Decatur (USPHS), East Hannibal, East Peoria (USPHS), East St. Louis, Edgemont, Edwardsville, Effingham, Elsah, Fox Ridge State Park, George Field (USPHS), Gibsonia, Gossett, Grafton (USPHS), Grand Tower, Granite City (USPHS), Grayville, Greenville, Hannibal, Havana, Herod, Herrin, Hull, Johnston City (USPHS), Karbers Ridge, Lake Glendale, Marion, Maroa, Momence, Mount Vernon, Neoga, Oakwood, Olive Branch, Omaha, Peoria (USPHS), Pere Marquette State Park, Pike, Ridge Lake, Rock Island (USPHS), St. Joseph, Salem, Seneca (USPHS), Springfield (USPHS), Ware, West Vienna, and Willow Springs.

#### 8. *Culex peccator* Dyar & Knab

**LARVA.**—Very similar to larva of *erraticus*, differing as follows: upper head hairs short as in *erraticus* but only double or triple; body only sparsely spiracular; comb with the scales forming a definite patch rather than an irregular line.

**ADULTS.**—Similar in size, color, and general structure to those of *erraticus*. Both sexes differ in having almost the entire occiput covered with appressed and overlapping scales, at the most with a narrow mesal line of narrow scales. Males differ in characters of the genitalia, fig. 94: the basistyle is nearly globular, as in *erraticus*, the subapical lobe is very definite, the leaflet large, irregular, and expanded, the stalks thicker and definitely proportioned; dististyle very thick, sharply bent at nearly a right angle with a series of concavities and brushlike lines of minute setae.

Like the preceding, this species occurs throughout the southeastern states, where it is usually a rarity. In Illinois, we have taken only a few records of the species and most of these are in the southern fifth of the state. The larvae presumably frequent woodland pools with emergent vegetation. King, Bradley, & McNeel (1939) note that the larvae, when found, are almost always associated with those of *apicalis*.



Illinois Records.—CARBONDALE: June 22–23, 1942, 1 ♂, 2 ♀; October 19, 1943, 1 ♂. CARTERVILLE: Aug. 13, 1942, 1 ♂. GOSSETT: June 3, 1942, Ross & Mohr, 3 larvae. GRANTSBURG: June 10, 1941, Ross & Mohr, 1 larva. LA RUE: Oct. 1, 1942, 1 ♂. OLNEY: June 10, 1941, Ross & Mohr, 1 larva. SCOTT FIELD: Sept. 10, 1942, light trap, 1 ♂.

### 9. *Aedes* Meigen

To this genus belong nearly half of the Illinois mosquito fauna, with records for 21 species, which include nearly all of the truly nuisance species and both early spring and temporary summer pool species. One or two of the species transmit mammalian diseases.

In all species of the genus, as far as known, the eggs are laid on moist soil or humus, or just above the water line in tree holes or artificial containers. They hatch only after they have been flooded. Some species, in which a desiccation and cold period is necessary for hatching, have only a single generation per year, the adults emerging in early spring. Other species are intermittent breeders and usually have two or three generations per year, depending on the rains.

Certain taxonomic difficulties were encountered in studying the genus. The most important resulted in the discovery that in many of the species the head hairs of the larvae were extremely variable, with the result that often in the then existing keys each side of the head of a single individual would key out to a different species. Frequently, on this same basis, specimens of a pure culture would key out to several species. With the Illinois species it was possible to circumvent this difficulty by introducing new key characters especially concerning the relative positions of various stable hairs.

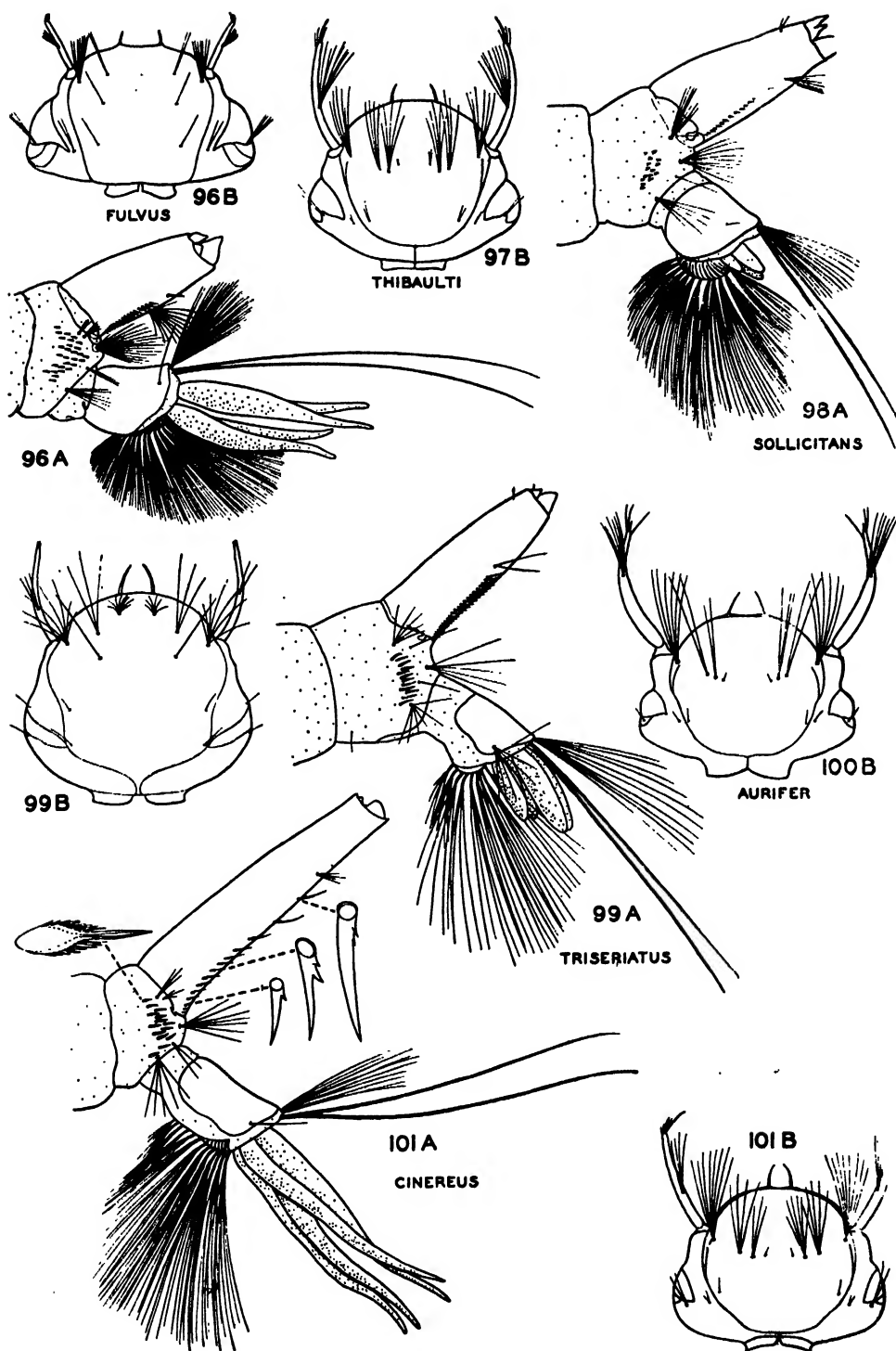
Supplemental material regarding extralimital species may be found in all of the comprehensive treatments of the family listed under the heading "Literature" on page 15.

#### KEY TO SPECIES

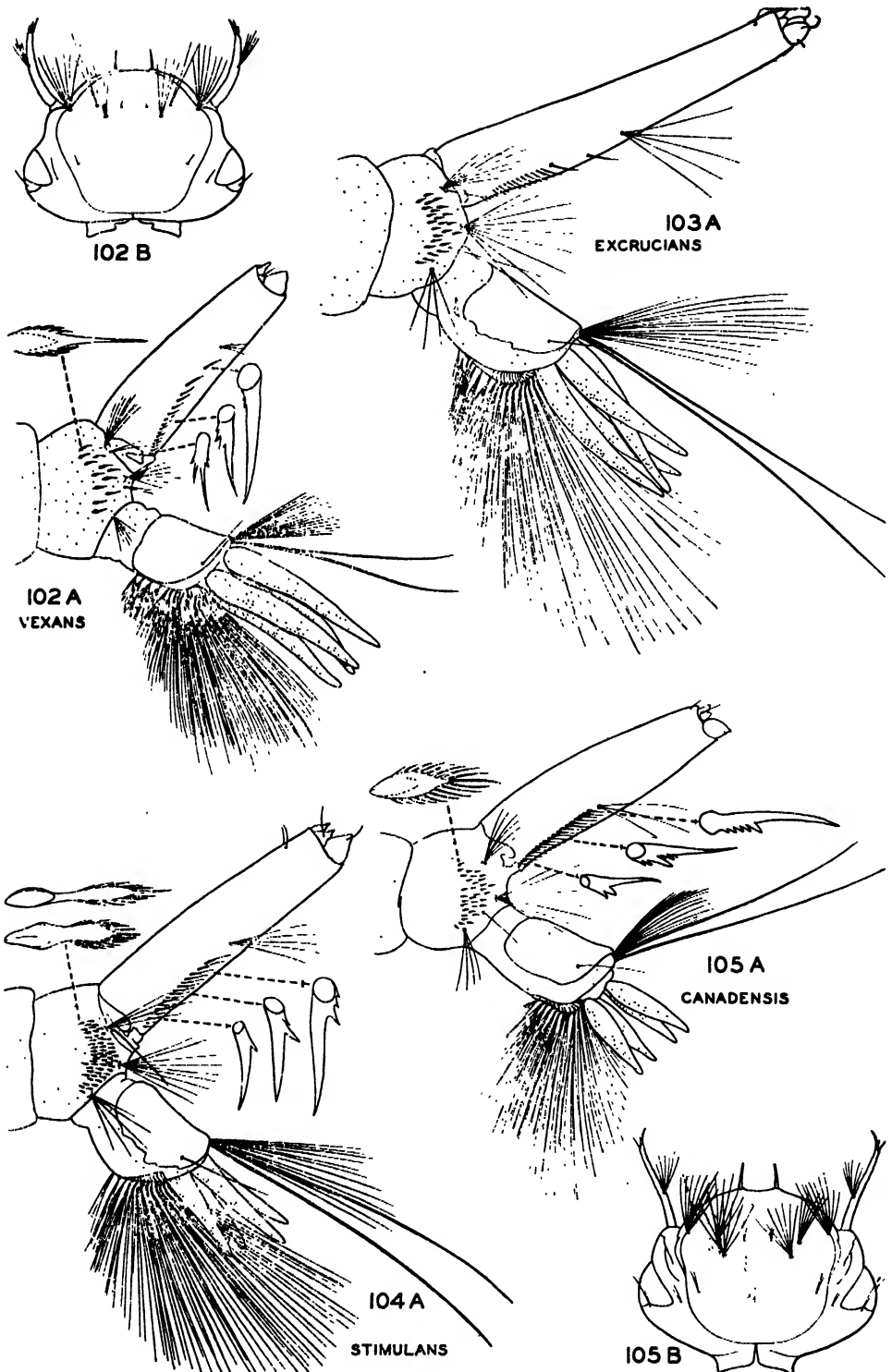
##### LARVAE

1. Anal segment completely ringed by sclerotized plate, fig. 96.....2  
Anal segment with sclerotized plate not meeting on venter, frequently forming only a dorsal saddle, fig. 99.....9
2. Pecten extending beyond ventral tuft, fig. 96.....21. *fulvus pallens*

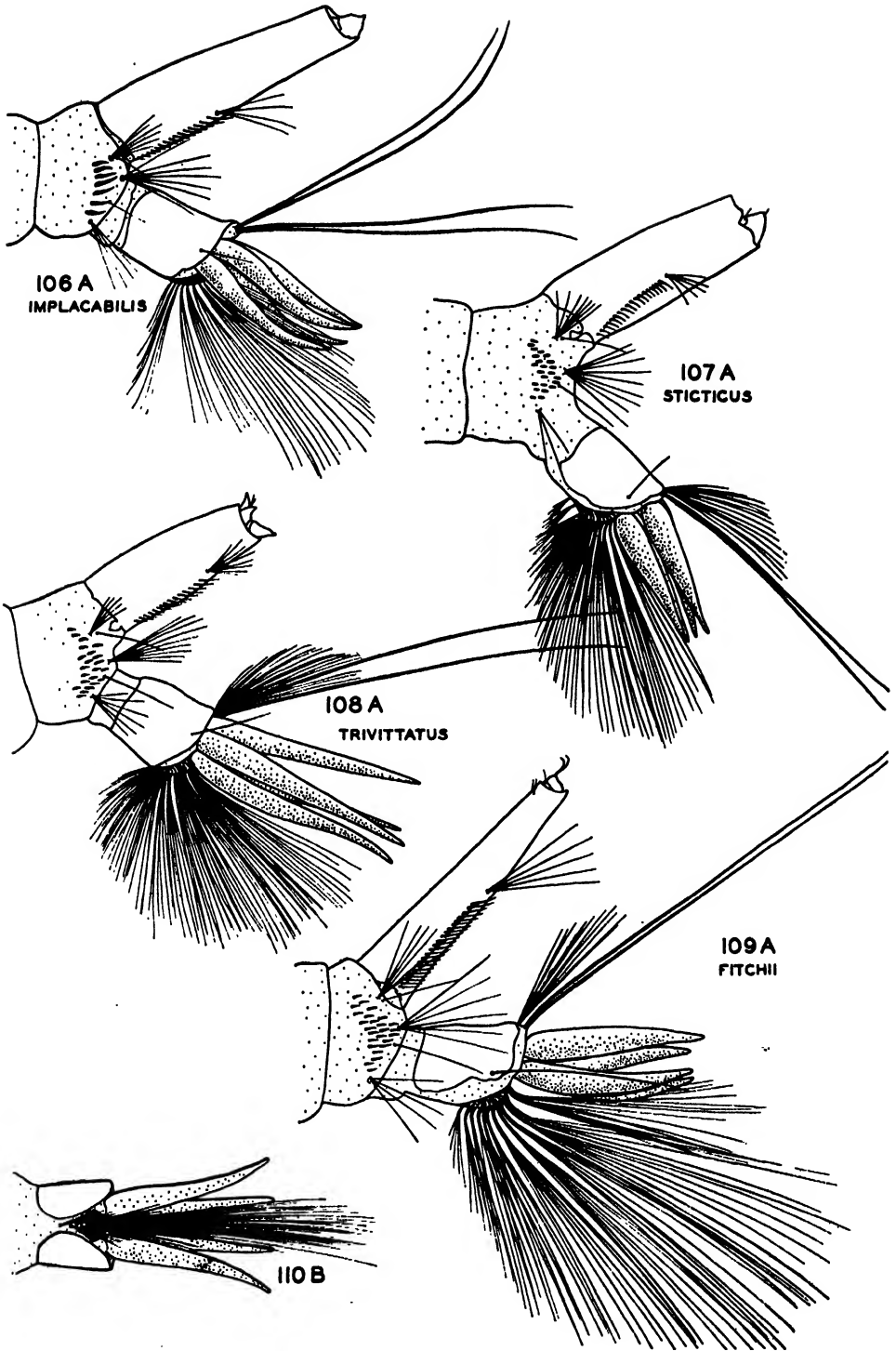
- Ventral tuft situated beyond end of pecten, fig. 98.....3
3. Gills budlike, much shorter than anal segment, fig. 98.....4. *sollicitans*  
Gills at least as long as anal segment, fig. 99, frequently very long and pointed at tip, fig. 101.....4
4. Gills extremely long, two or three times length of air tube, and with prominent tracheae, fig. 111; pecten with only a few scales.....20. *dupreei*  
Gills shorter than air tube, without tracheae, fig. 106; pecten with about 15 scales.....5
5. Air tube short, not more than two and one-half times as long as wide, and pecten with several widely detached teeth.....5. *nigromaculis*  
Either air tube over three times as long as wide, or pecten without detached teeth.....6
6. Comb consisting of about 12 scales or less forming a single row, fig. 106.....7  
Comb either consisting of 15 or more scales or forming a double row or triangular patch, fig. 108.....8
7. Comb with 6 evenly spaced teeth; apico-dorsal tuft of anal segment represented by a pair of long, strong setae, as in fig. 106.....22. *implacabilis*  
Comb with about 12 teeth forming an irregular line; apico-dorsal tuft of anal segment many haired, fanlike, fig. 107.....23. *punctor*
8. Air tube with ventral brush two-thirds distance from base to apex, fig. 108....  
.....14. *trivittatus*  
Air tube with ventral brush midway between base and apex.....6. *mittchellae*
9. Head with preantennal hair delicate and single, fig. 112; anal segment with preapical dorsal tuft only three-branched, but as long as apical tuft....2. *aegypti*  
Head with preantennal hair divided into a 4- to 15-branched tuft, fig. 113; anal segment with preapical dorsal tuft 8- to 15-branched, much shorter than apical tuft.....10
10. Pecten with one or more apical teeth spaced fairly wide apart, appearing detached from row, figs. 101–103...11  
Pecten with all teeth close together and forming an even row, figs. 104, 105...16
11. Head with lower head hair considerably laterad of, and only slightly anterior of, upper head hair, fig. 100.....12  
Head with lower head hair only slightly laterad of, but considerably anterior of, upper head hair, fig. 102.....13
12. Antennae fairly thick at base and long, tuft beyond middle, fig. 100; upper and lower head hairs double, occasionally



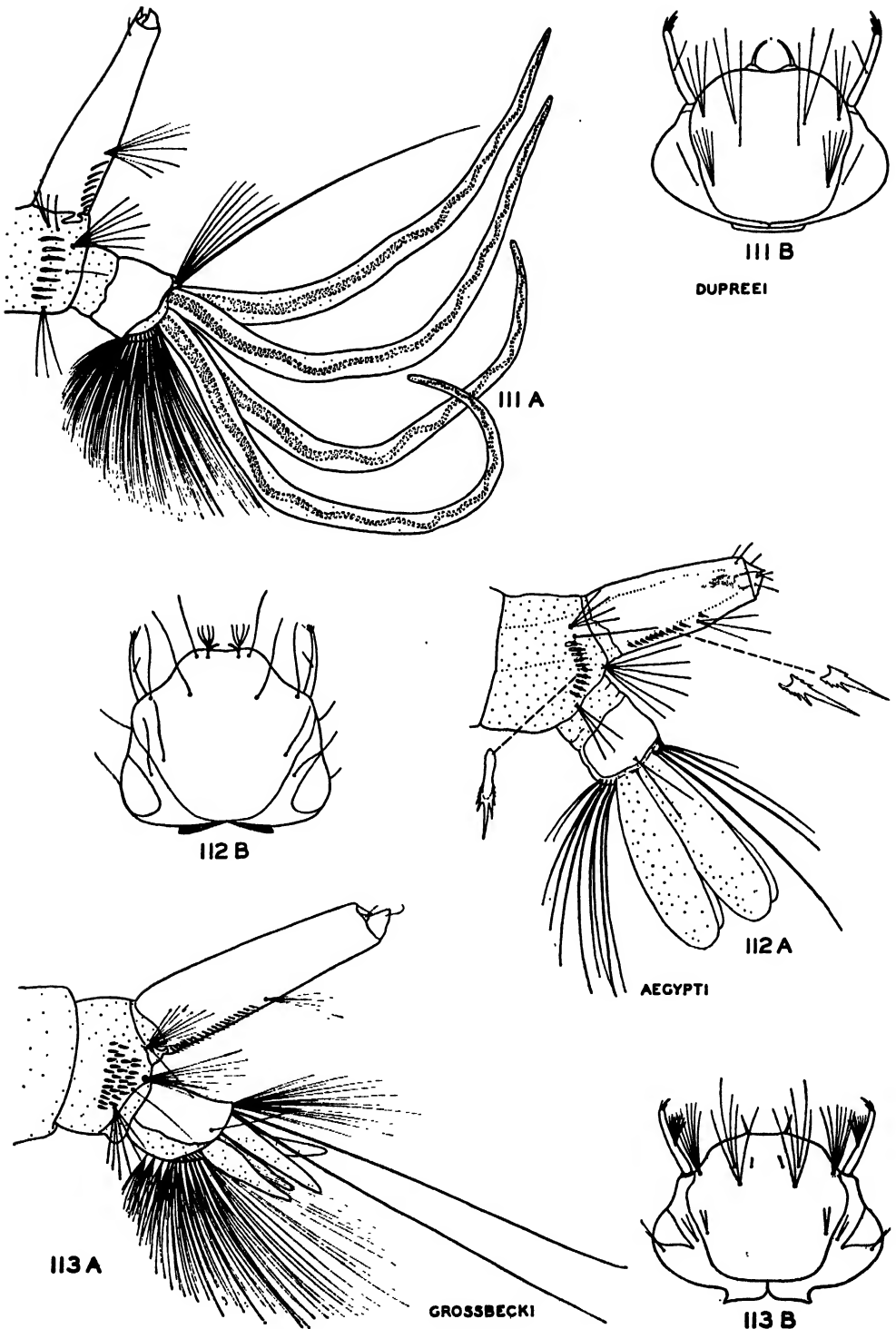
Figs. 96-101.—*Aedes* larvae; A, apex of abdomen, lateral aspect; B, dorsum of head. Inset are details of pecten and comb scales. On these and succeeding larval head drawings of *Aedes*, the mouth brushes are omitted.



Figs. 102-105.—*Aedes* larvae; A, apex of abdomen, lateral aspect; B, dorsum of head. Inset are enlarged drawings of pecten and comb scales.



Figs. 106-110.—*Aedes* larvae, apex of abdomen. All are the lateral aspect except fig. 110B, which is the ventral aspect of *A. spencerii* showing one or two anal hair tufts anterior to the barred area at base of gills.



Figs. 111-113.—*Aedes* larvae; *A*, apex of abdomen, lateral aspect; *B*, dorsum of head. Inset are enlarged drawings of pecten and comb scales. (Fig. 111 redrawn from Dyar.)

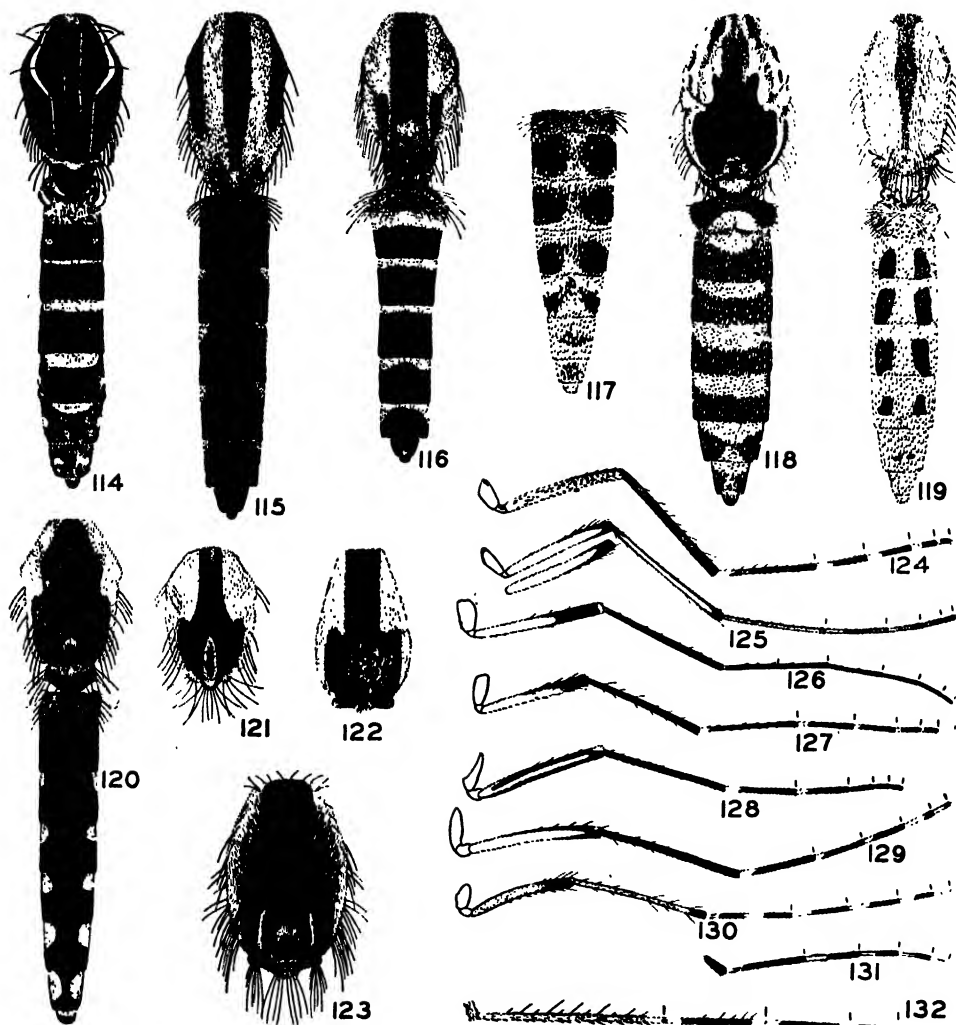
- one of the four triple; clypeal bristles moderately far apart. . . . . 15. *aurifer*  
 Antennae not enlarged at base, tuft below middle, fig. 101; upper and lower head hairs triple to multiple, at least two of the four with four to six branches; clypeal bristles much closer together. . . . . 7. *cinereus*
13. Air tube five times as long as width at middle of pecten, its ventral tuft very long, fig. 103. . . . . 8. *excrucians*  
 Air tube not more than four times as long as width at middle of pecten, its ventral tuft frequently short, fig. 102. . . . . 14
14. Upper and lower head hairs single; anal segment with only one or two tufts anterior to apico-ventral barred area, fig. 110. . . . . 19. *spencerii*  
 Upper and lower head hairs double to quadruple; anal segment with several tufts anterior to barred area, fig. 102. . . . . 15
15. Lateral comb consisting of more than 20 scales in a triangular patch. . . . . 9. *flavescens*  
 Lateral comb consisting of 10 to 15 scales in an irregular single or double row, fig. 102. . . . . 3. *vexans*
16. Gills budlike, much shorter than anal segment, as in fig. 98*A*. . . . . 16. *dorsalis*  
 Gills long, either tapering at apex, fig. 104, or sausage shaped, fig. 99. . . . . 17
17. Lateral comb of segment 8 forming a single row or an irregular double row of about 10 to 15 large well-spaced teeth, fig. 99. . . . . 1. *triseriatus*  
 Lateral comb forming a somewhat triangular patch containing 20 or more teeth, figs. 104, 109. . . . . 18
18. Both upper and lower head hairs with four or more branches, short, similar in length and appearance to preantennal hair; clypeal hairs only about half as far apart as upper head hairs, fig. 105. . . . . 17. *canadensis*  
 Either upper or lower head hairs with only three branches or less, much longer than preantennal hair, or clypeal hairs about as far apart as upper head hairs, fig. 97. . . . . 19
19. Lower head hairs situated considerably to the side of, and only slightly anterior to, upper head hairs, the upper hairs usually with five branches or more; antennae very long, three-quarters length of head, with antennal tuft very long, fig. 97. . . . . 12. *thibaulti*  
 Lower head hairs almost directly anterior to, and only slightly laterad of, upper head hairs, the latter only rarely with as many as four or five branches; antennae shorter, with a shorter tuft, fig. 113. . . . . 20
20. Air tube five times as long as width at middle of pecten, tapering markedly, so that apex is about half width of base, fig. 109*A*, its apical spine long and dark. . . . . 11. *fitchii*  
 Air tube at most four times as long as width at middle of pecten, tapering less, so that apex is about three-quarters width at base, its apical spine short and inconspicuous, fig. 107. . . . . 21
21. Sclerotic plate of anal segment only slightly longer than deep, extending more than three-quarters distance down sides of segment, fig. 107; air tube with ventral tuft only about half as long as tuft posterior to comb. . . . . 18. *sticticus*  
 Sclerotic plate of anal segment much longer than deep, extending only one-half or two-thirds distance down sides of segment, fig. 104; air tube with ventral tuft about as long as tuft posterior to comb. . . . . 22
22. Lower head hairs usually single; prothoracic hairs 4 and 7 single; ventral tuft of air tube usually with three or four hairs. . . . . 10. *stimulans*  
 Lower head hairs usually double or triple; prothoracic hairs 4 and 7 usually double; ventral tuft of air tube usually with five to eight hairs. . . . . 13. *grossbecki*

## FEMALES

1. Tarsi with white rings, figs. 127-132. . . . . 2  
 Tarsi without white rings, figs. 125, 126. . . . . 13
2. Tarsi with narrow rings at both ends of some segments, fig. 132. . . . . 3  
 Tarsi each with a ring at only one end of a segment, fig. 130. . . . . 4
3. Wing scales uniformly dark. . . . . 17. *canadensis*  
 Wing scales mostly white with a small mixture of black scales. . . . . 16. *dorsalis*
4. Proboscis dark with a definite white band, fig. 35. . . . . 5  
 Proboscis nearly uniformly colored. . . . . 7
5. All wing scales dark; hind basitarsus black with a single basal white band, fig. 131. . . . . 6. *mittellae*  
 Some wing scales black, some white, giving a spotted appearance; hind basitarsus frequently with a middle yellowish band in addition to basal white band, fig. 130. . . . . 6
6. Abdomen with extensive dorsal areas of cream or tawny scales and small lateral areas of white scales, the two colors definitely contrasting. . . . . 4. *solicitans*  
 Abdomen with both dorsal and lateral pale scales white. . . . . 5. *nigromaculis*

7. Mesonotum black with lyre-shaped silver markings, fig. 114.....2. *aegypti*  
 Mesonotum otherwise, figs. 115-123, never  
 with extensive silver lines.....8

8. White tarsal rings narrow, fig. 127.....3. *vexans*  
 White tarsal rings wider, figs. 124, 130  
 .....9



Color Patterns of Female *Aedes*

Fig. 114.—*A. aegypti*, dorsum of thorax and abdomen.

Fig. 115.—*A. trivittatus*, dorsum of thorax and abdomen.

Fig. 116.—*A. sticticus*, dorsum of thorax and abdomen.

Fig. 117.—*A. spencerii*, dorsum of abdomen.

Fig. 118.—*A. grossbecki*, dorsum of thorax and abdomen.

Fig. 119.—*A. dorsalis*, dorsum of thorax and abdomen.

Fig. 120.—*A. triseriatus*, dorsum of thorax and abdomen. This figure illustrates dark phase of thoracic pattern.

Fig. 121.—*A. triseriatus*, dorsum of thorax of light phase.

Fig. 122.—*A. thibaulti*, dorsum of thorax. (After King, Bradley, & McNeel.)

Fig. 123.—*A. aurifer*, dorsum of thorax.

Fig. 124.—*A. grossbecki*, hind leg.

Fig. 125.—*A. sticticus*, hind leg.

Fig. 126.—*A. triseriatus*, hind leg.

Fig. 127.—*A. vexans*, hind leg.

Fig. 128.—*A. aegypti*, middle leg.

Fig. 129.—*A. aegypti*, hind leg.

Fig. 130.—*A. sollicitans*, hind leg.

Fig. 131.—*A. mitchellae*, hind tarsus.

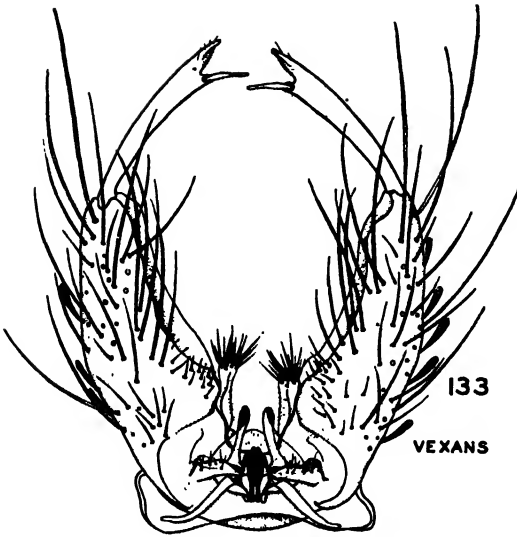
Fig. 132.—*A. dorsalis*, hind tibia and tarsus.

9. All veins of wings with rows of very wide scales, fig. 169; mesonotum as in fig. 118, with a large central black spot enlarged posteriorly.....13. *grossbecki*  
Some veins with rows of only long narrow scales, fig. 168; mesonotum marked otherwise.....10
10. Abdomen entirely covered with yellowish scales, without banding; mesonotum entirely yellowish.....9. *flavescens*  
Either abdomen with decided banding or mesonotum with a pattern of gray or reddish brown.....11
11. Lower part of mesepimeron with three to five fine long bristles; mesonotum frequently patterned with light gray brown, but occasionally reddish brown.....10. *stimulans*  
Lower part of mesepimeron with none to two fine long bristles; mesonotum always predominantly reddish brown.....12
12. Mesonotum with a fairly narrow reddish-brown stripe, flanked with white or cream; one or two lower mesepimeral bristles usually present.....11. *fitchii*  
Mesonotum with reddish-brown central area larger and not well defined; no lower mesepimeral bristles present....8. *excrucians*
13. Mesonotum with a definite mesal silvery triangle, flanked with dark areas.....20. *dupreei*  
Mesonotum without a mesal silvery triangle, usually with a mesal dark area flanked with light areas, figs. 115, 121.....14
14. Mesonotum with very dark or black mesal area flanked by gray or silvery areas, figs. 115, 121.....15  
Mesonotum brown or yellow, often uniform in color, sometimes with mesal area reddish brown and lateral areas light golden brown.....20
15. Central stripe of mesonotum narrow, tapering posteriad, well defined, fig. 115.....14. *trivittatus*  
Central stripe either wider posteriad, fig. 121, or parallel sided, fig. 116.....16
16. Central stripe of mesonotum parallel sided, sometimes with a pair of detached short dark stripes along posterior half, fig. 116; abdominal tergites with complete basal or mesal white bands.....17  
Central stripe of mesonotum much narrower anteriorly, usually widened posteriorly to almost the full width of the mesonotum, figs. 121, 123, abdominal tergites mostly blue black, with lateral white spots on some segments, but without bands, fig. 120.....18
17. Abdomen with light stripes narrow, regular and basal, widest on basal segment, fig. 116, without mesal or apical stripes.....18. *sticticus*  
Abdomen with light stripes basal, apical and mesal, narrowest on basal segments and almost covering the apical segments, fig. 117.....19. *spencerii*
18. Scales of postero-lateral lobes of pronotum white and wide, markedly overlapped to form a solid shingled area, fig. 170, very similar to scales of mesopleurae.....1. *triseriatus*  
Scales of postero-lateral lobes of pronotum long and narrow, only half as wide as mesopleural scales, tawny or yellowish in color and not solidly shingled, fig. 171, markedly contrasting with scales of mesopleurae.....19
19. Mesal dark mark of mesonotum with anterior portion narrow, suddenly widened beyond middle to include nearly full width of mesonotum, fig. 122; anterolateral areas bright grayish white.....12. *thibaulti*  
Mesal dark mark of mesonotum with anterior part wider, widening gradually to posterior margin, fig. 123; lateral areas grayish, shading to a golden tint where they merge with mesal dark area....15. *aurifer*
20. Integument and scaling entirely bright golden yellow, except a few black-scaled areas.....21. *fulvus pallens*  
Integument dark brown to black, with few or no yellow scales.....21
21. Maxillary palps with apical segments only slightly longer than basal segments; wing at most 4.3 mm. long; abdomen with very narrow cream basal bands on dorsum but with all of ventral part of tergites cream.....7. *cinereus*  
Maxillary palps with apical segments twice as long as basal segments; wing over 4.8 mm. long; abdomen either with wide basal bands, or ventral part of tergites with considerable areas of dark scales.....22. *implacabilis*; 23. *punctator*

## MALES

1. Dististyle inserted before apex of basistyle, the portion beyond the dististyle forming an apical cone, fig. 135.....7. *cinereus*  
Dististyle articulating as extreme apex of basistyle, fig. 133.....2
2. Dististyle wide near apex, terminating in a sharp projection that is nearly as long as terminal spine; claspettes forming a small, bushy lobe, fig. 133....3. *vexans*  
Dististyle narrow at apex, tipped by terminal spine, fig. 134.....3
3. Claspettes absent, fig. 134.....2. *aegypti*  
Claspettes present, figs. 136-158.....4





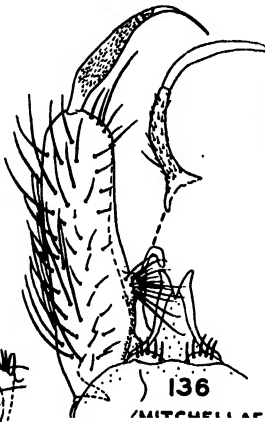
133  
VEXANS



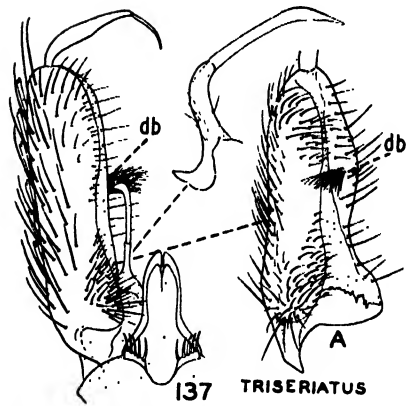
134  
AEGYPTI



135  
CINEREUS



136  
MITCHELLI



137  
TRISERIATUS



138  
SOLLICITANS

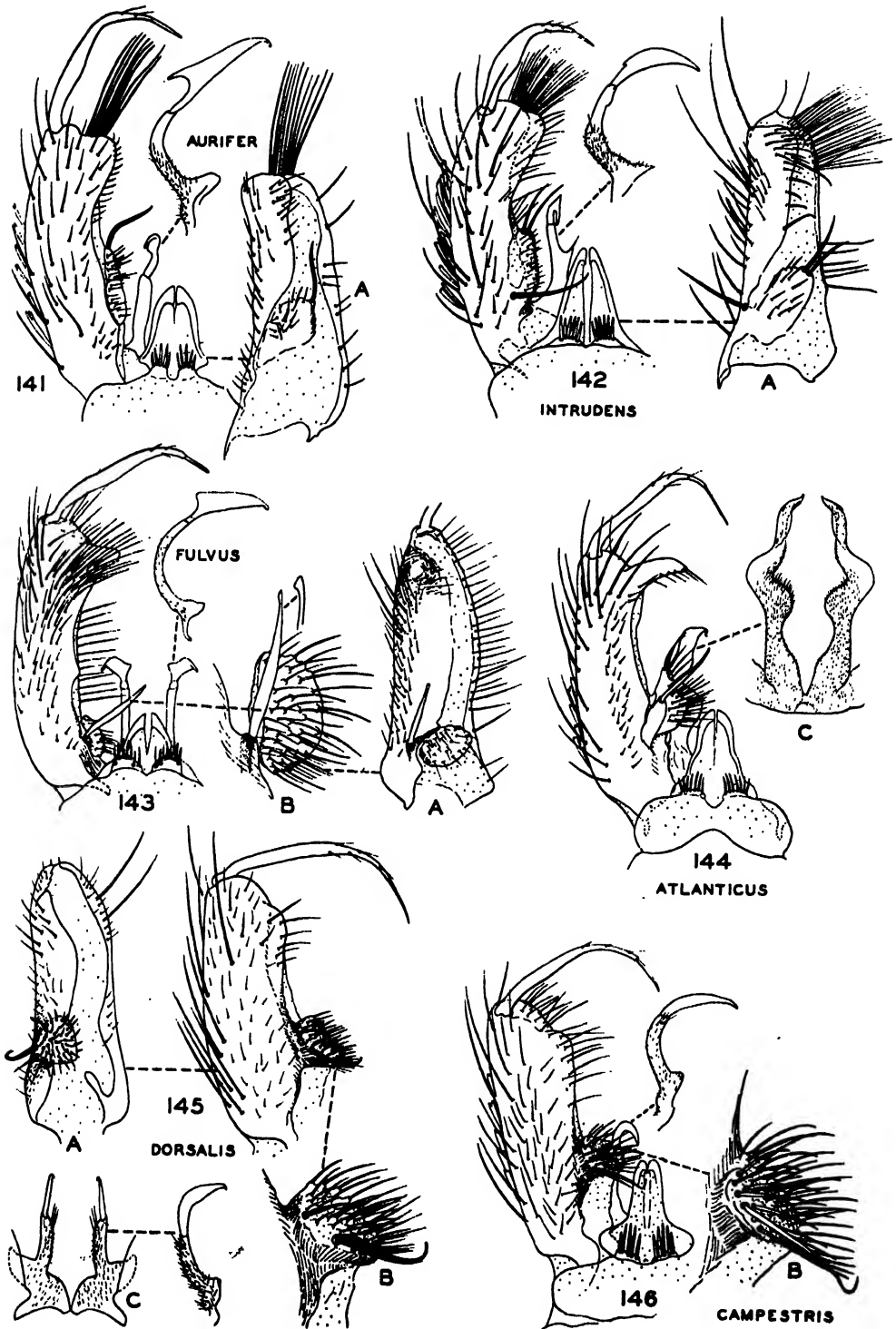


139  
THIBAUTI

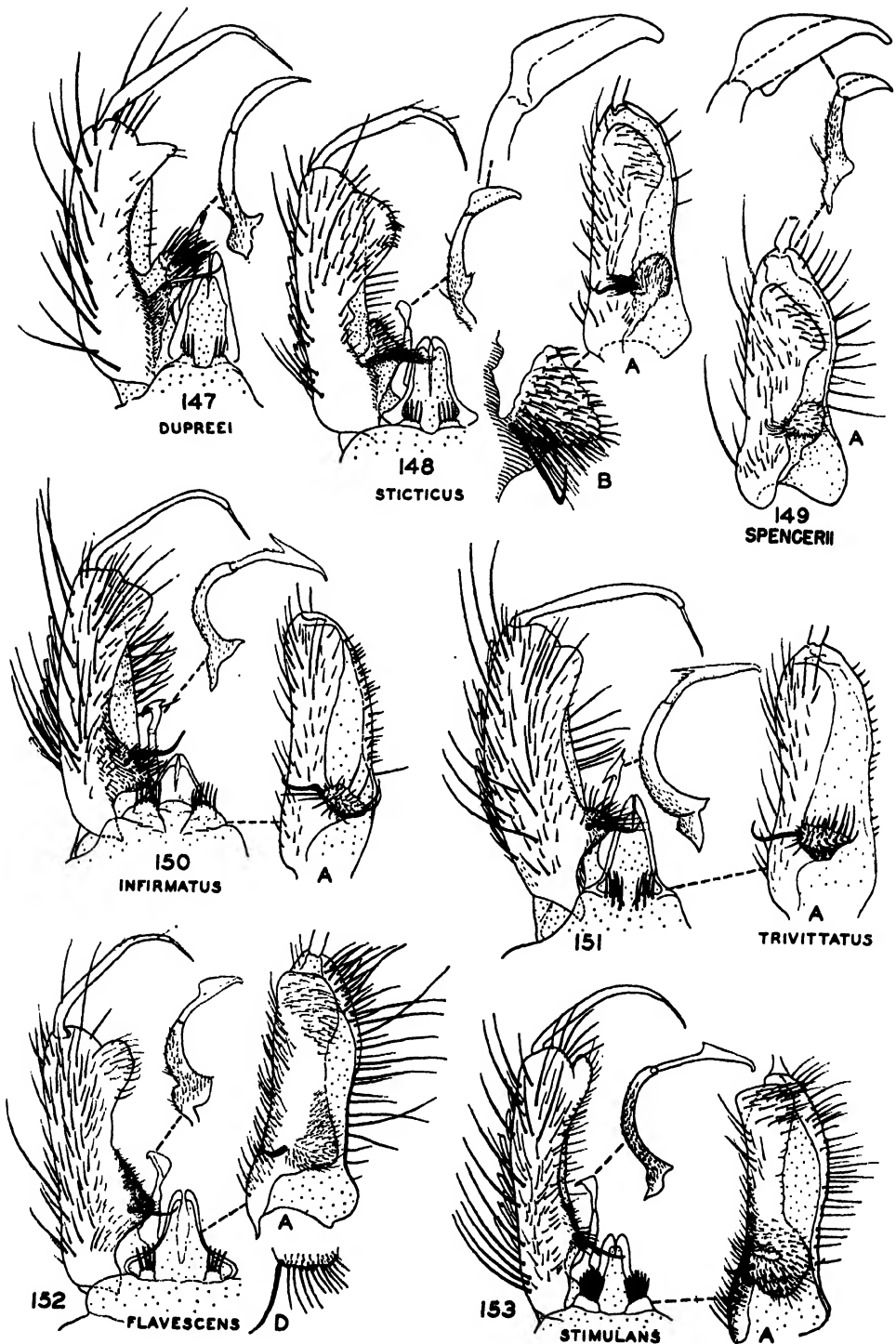


140  
CANADENSIS

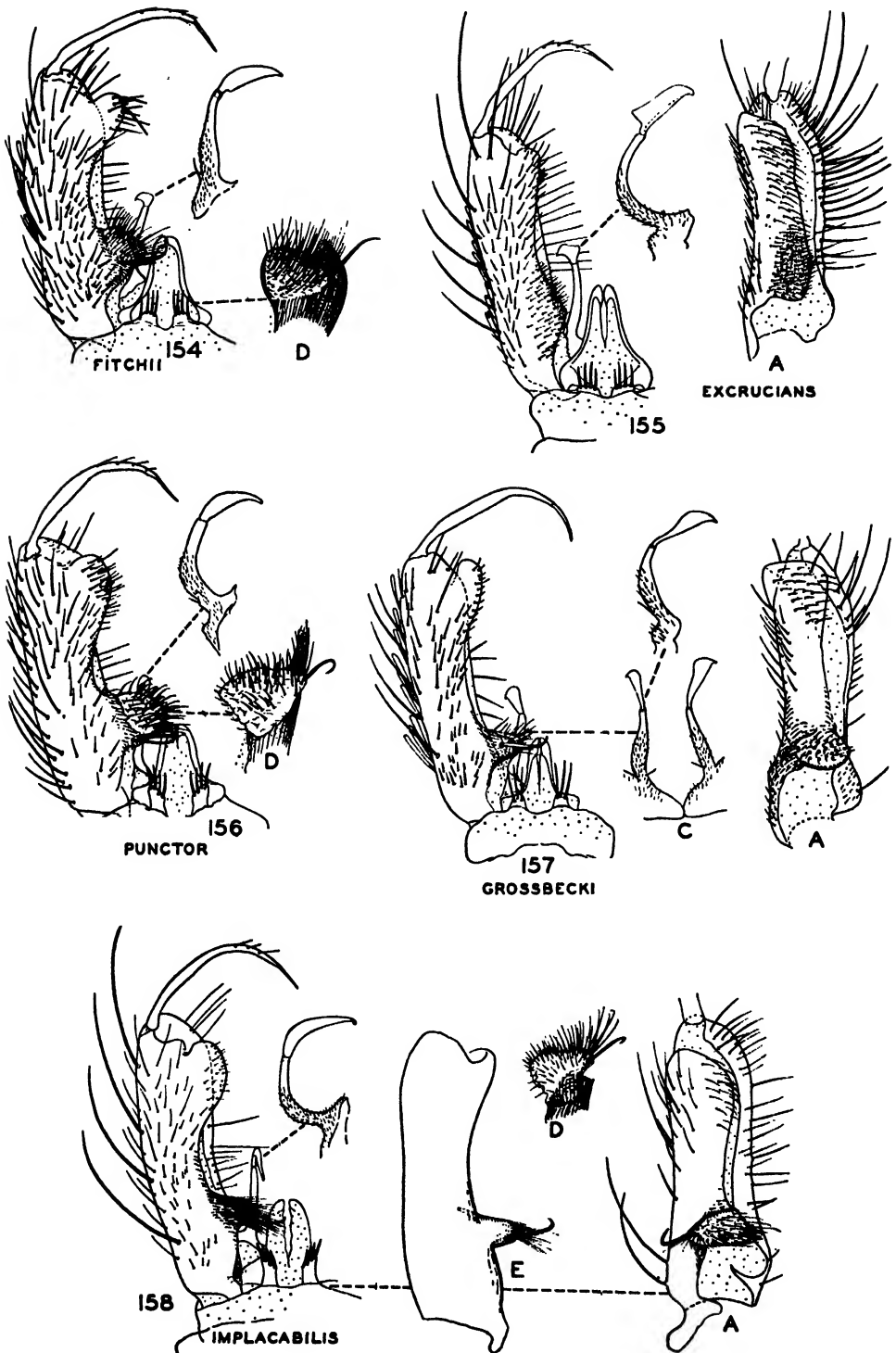
Figs. 133-140.—*Aedes*, male genitalia, ventral aspect; A, mesal aspect of bastistyle; db, dorsal brush; inset is claspette, lateral aspect. (Figs. 133, 134 after Matheson.)



Figs. 141-146.—*Aedes* male genitalia, ventral aspect. *A*, basistyle, mesal aspect; *B*, enlarged detail of basal lobe, ventral aspect; *C*, claspettes, dorsal aspect; inset is claspette, lateral aspect.



Figs. 147-153.—*Aedes* male genitalia, ventral aspect. *A*, basistyle, mesal aspect; *B*, basal lobe, ventral aspect; *D*, basal lobe, posterior aspect; inset is claspette, lateral aspect and in figs. 148 and 149 a detail of its apex.



Figs. 154-158.—*Aedes* male genitalia, ventral aspect. *A*, basistyle, mesal aspect; *C*, claspette, dorsal aspect; *D*, basal lobe, posterior aspect; *E*, basistyle, ventro-lateral aspect silhouette; inset, claspette, lateral aspect.

4. Basistyle without apical lobe, figs. 136-138 ..... 5  
     Basistyle with apical lobe definitely developed, figs. 139, 140, or represented by a mass of long setae, figs. 141, 142 ..... 7
5. Basistyle with a thick brush of setae (*db*) on dorsal side, fig. 137; basal lobe with a large area of setae ..... 1. *triseriatus*  
     Basistyle without a brush of setae on dorsal side, but with a definite brush forming the basal lobe, figs. 136, 138 ..... 6
6. Basal lobe a distinct, raised prominence; basistyle considerably widened at basal lobe, fig. 136 ..... 6. *mittchellae*  
     Basal lobe represented by only a slightly raised disclike area; basistyle only imperceptibly widened at this point, fig. 138 ..... 5. *nigromaculis*; 4. *solicitans*
7. Apical process of claspette massive and contorted, fig. 139, the contorted portion thin and pale ..... 12. *thibaulti*  
     Apical process of claspette forming a narrow blade, which may be straight, fig. 140, curved, fig. 143, or barbed, fig. 141 ..... 8
8. Basistyle with a dense patch of long setae at apex; basal lobe forming a flat sclerite on mesal face, with a single long dorsal spine, fig. 141 ..... 15. *aurifer*  
     Basistyle without a dense apical patch of long spines, but with a well-developed apical lobe; basal lobe otherwise, either projecting, or with a large ventral spine, or without a spine, sometimes with a cluster of long setae ..... 9
9. Apical lobe with a large dense patch of spatulate setae, fig. 140 ..... 17. *canadensis*  
     Apical lobe with setae all narrow and hairlike, figs. 143-158 ..... 10
10. Apical lobe of basistyle very long, a distinct angulation near middle of basistyle, fig. 143; integument of almost entire body yellow ..... 21. *fulvus pallens*  
     Apical lobe either short, fig. 144, or without an extra angulation, fig. 145; integument chiefly dark brown or black ..... 11
11. Basal lobe with two macrochaetae and many small setae, those near the macrochaetae minute, fig. 145 ..... 16. *dorsalis*  
     Basal lobe at most with only one macrochaeta, sometimes with some of the other setae very long, fig. 147 ..... 12
12. Basal lobe triangular and appearing detached, joined to basistyle by only a narrow sclerotized strip, figs. 147-149 ..... 13  
     Basal lobe forming a solid part of the basistyle ..... 15
13. Apical lobe small, fig. 147, with a few projecting setae along its mesal margin ..... 20. *dupreei*  
     Apical lobe large, fig. 148, with numerous appressed setae along its mesal margin ..... 14
14. Appendage of claspette wide, its lower basal corner produced; mesal aspect of apical lobe long and narrow, fig. 149 ..... 19. *spencerii*  
     Appendage of claspette narrower, its lower margin almost confluent in outline with claspette; mesal aspect of apical lobe shorter, decidedly ovate, fig. 148 ..... 18. *sticticus*
15. Basal lobe without macrochaetae, having only abundant short setae, fig. 155 ..... 8. *excrucians*  
     Basal lobe with at least one conspicuous macrochaeta or a group of long setae, fig. 154 ..... 16
16. Head of claspette produced backward into a sharp basal barb, fig. 151 ..... 14. *trivittatus*  
     Head of claspette without a barb, fig. 152 ..... 17
17. Basal lobe composed primarily of an area of short setae forming the basal portion of the mesal face of the basistyle, figs. 152, 153 ..... 18  
     Basal lobe represented by a distinct lobe projecting mesad from the basistyle, figs. 154, 156 ..... 19
18. Area comprising basal lobe long and triangular, its basal spine very large, fig. 152; appendage of claspette fairly short ..... 9. *flavescens*  
     Area comprising basal lobe shorter, its lower portion somewhat projecting, its basal spine only moderately large, fig. 153; appendage of claspette very long and slender; a membranous "island" above macrochaeta ..... 10. *stimulans*
19. Apical lobe short, appendage of claspette elongate with a narrow necklike base, fig. 157 ..... 13. *grossbecki*  
     Apical lobe very long, fig. 156, or appendage of claspette without a basal neck, fig. 154 ..... 20
20. Basal lobe with membranous, setiferous portion hidden behind sclerotized ventral shoulder, fig. 158, which projects ventro-mesad ..... 22. *implacabilis*  
     Basal lobe with membranous, setiferous portion well exposed from ventral aspect, and without a projecting ventral shoulder, figs. 154, 156 ..... 21
21. Basal lobe with sparse and moderately short setae, without a sclerotized band along the dorsal and mesal periphery; apical lobe with abundant setae on mesal face, fig. 156 ..... 23. *punctor*  
     Basal lobe with abundant longer setae which form a thick brush, and with a sclerotized collar around the dorsal and mesal periphery, fig. 154; apical lobe with a few long setae on mesal face ..... 11. *fitchii*

## THE SUBGENERIC UNITS

An investigation of characters of the female genitalia indicates that the subgenera represented in the Illinois *Aedes* fauna are readily segregated on these characters. In those subgenera in which we have more than one species, either no differences were found among the included species (in the case of *Taeniorhynchus*), or the differences observed among the various species were so slight and of such a comparative nature that it was impractical to use them as a basis for identification. These findings follow closely those of Gjullin (1937), who treated western species of the genus.

DIAGNOSIS OF SUBGENERA REPRESENTED  
IN ILLINOIS

(BASED ON FEMALE GENITALIA)

1. Postgenital plate elongate, extending three-fourths distance to tip of cerci; eighth segment large and well sclerotized, with short basal membrane, fig. 160. Sole Illinois species, *triseriatus*... *Finlaya*  
Postgenital plate shorter, its tip not reaching half the distance to tip of cerci, fig. 159 ..... 2
2. Apical margin of eighth sternite with a deep mesal cleft or incision, figs. 159, 163 ..... 3  
Apical margin of eighth sternite with only a shallow indentation, fig. 164, or transverse, fig. 167 ..... 4
3. Cerci little longer than ninth tergite; postgenital plate with rounded apex; eighth segment nearly as high as long, fig. 163. Sole Illinois species, *aegypti* .....  
..... *Stegomyia*  
Cerci nearly twice as long as ninth tergite; postgenital plate with apex notched; eighth segment nearly twice as long as high, fig. 159. Sole Illinois species, *vexans* ..... *Aedimorphus*
4. Eighth tergite and sternite almost entirely membranous, with minute sclerotized spots at bases of some setae; apex of eighth sternite forming a moderately sclerotized "flap," which is slightly incised on meson, fig. 164. Only Illinois species, *sollicitans* and *mitchellae* .....  
..... *Taeniorhynchus*  
Eighth segment moderately and uniformly sclerotized throughout the principal sclerites ..... 5
5. Eighth segment nearly as high as long, the sternite with its apical margin sinuate and not projecting beyond the tergite; cerci short; postgenital plate with a deep cleft, fig. 166. Sole Illinois species, *cinereus* ..... *Aedes*

Either segment much longer than high, fig. 167, or sternite with nearly straight apical margin, projecting markedly beyond tergite, fig. 162; cerci frequently long, fig. 167, and postgenital plate usually with only a shallow cleft. Contains most of the Illinois species of the genus ..... *Ochlerotatus*

Subgenus *Finlaya* Theobald1. *Aedes triseriatus* (Say)

LARVA.—Fig. 99. Head slightly longer and more rounded than in most other members of the genus; upper head hairs long, slender, and single or double; lower head hairs shorter, double to quadruple, and having between them a pair of distinct plumose tufts. Eighth segment with comb forming a single row varying from a regular one composed of 6 or 8 teeth to a dense, irregular row consisting of 10 to 14 teeth. Air tube about three times as long as wide, both the dorsal and ventral margins curving to form a tapered apex; hair tuft long, single or double, and situated beyond pecten; pecten with 15 to 20 fairly even and quite regularly spaced, closely set teeth. Anal segment with dorsal plate covering only the dorsal half of the segment and bearing a multiple tuft at its postero-ventral corner; anal gills rounded at apex, short, the ventral pair shorter than dorsal pair.

FEMALE.—Length of wing 4 mm. Beak and palps black scaled; back of head silver scaled. Mesonotum with a black central portion and silver lateral areas forming a pattern shown in figs. 120, 121; there is considerable variation in the shape of these markings. Pleural areas with patches of very dense silvery scales. Abdomen with dorsum chiefly blue-black scaled, segments 4-7 with lateral patches of white scales which are smallest on 4, increase posteriorly and usually form a solid white band on 7, venter conspicuously banded with black and white, the white predominating. Legs with tibiae and tarsi blue black, femora with basal half cream, apex blue black, sometimes the anterior face almost entirely blue black. Wings entirely dark scaled.

MALE.—Color identical with that of female. Palps extremely long, projecting beyond beak. Male genitalia, fig. 137, characterized as follows: basistyle without definite apical or basal lobes, the meso-basal portion of the ventral aspect having a large loose brush and dorsal portion having a

conspicuous tuft near middle of mesal edge. Claspettes prominent, the base stout and short, the apical process long and slightly curved at apex.

Breeding primarily in water in tree hole cavities, this species is distributed over the entire state. The adults are sharp biters but apparently do not wander far from the woods in which occur their breeding places. In periods when the rainfall and sap flow refill the tree holes frequently during the summer, this species breeds almost continuously. Development of the larvae is very slow compared to that of species which occur in ground pools. The few observations we have made indicate that the larvae may require nearly a month during the summer to reach maturity. The species hibernates in the egg stage.

Recorded from the Chicago area by Gerhard in 1910, the species was listed as widespread throughout the state by Matheson in 1930.

**Illinois Records.**—Larvae, collected May 16 to September 16, and adults, collected May 10 to October 22, are from Belleville (USPHS), Cahokia (USPHS), Camp Grant (USPHS), Camp Ellis (USPHS), Chicago, Carterville (USPHS), Crab Orchard Lake (USPHS), Danville, Des Plaines, Dongola, Dubois, East St. Louis, Elsah, Epworth, Glencoe, Gorham, Great Lakes Naval Training Station, Havana, Homer, Johnston City (USPHS), Kappa, La Rue, Lawrenceville (USPHS), Mahomet, Marion (USPHS), Mascoutah, Mount Carmel, Mount Vernon (USPHS), Muncie, Oak Park, Oakwood, Onarga, Pike, Pulaski, Ravinia, Rising Sun, Rockford (USPHS), Roxana, St. Jacob, Scott Field (USPHS), Springfield, Starved Rock State Park, Urbana, Ware, Weldon Springs, and White Heath.

### Subgenus *Stegomyia* Theobald

#### 2. *Aedes aegypti* (Linnaeus)

**LARVA.**—Fig. 112. Head somewhat oval; preantennal hair and upper and lower hairs all very delicate, long, and single; upper hairs almost directly on a line between the two preantennal hairs; lower hairs anterior to upper hairs but situated close to anterior margin of head and with a pair of delicate tufts between them. Eighth segment with comb consisting of a single arcuate row of about 10 toothed scales. Air tube short and relatively stout, about two and one-half times as long as wide and with its ventral margin slightly concave; hair tuft fairly

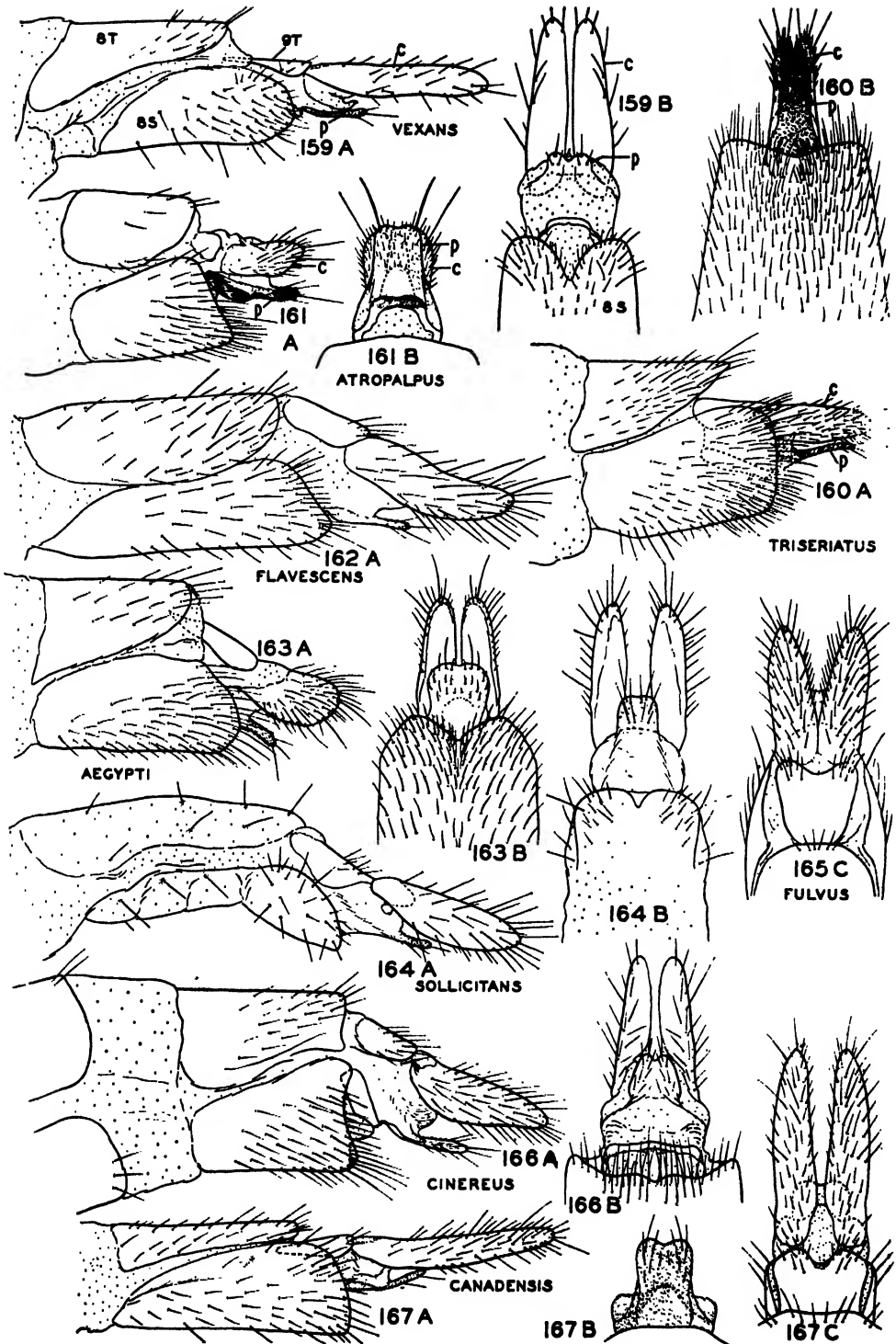
short, usually quadruple, situated just beyond end of pecten; pecten consisting of a close regular row of small teeth. Anal segment with a ventral membranous strip between edges of sclerotized band; each pre-apical dorsal tuft with three to four filaments, apical dorsal tufts each with two, the filaments of both of about equal length; anal gills sausage shaped and about as long as siphon.

**FEMALE.**—Figs. 114, 128, 129. Length of wing 3.5 mm. Entire body and appendages clothed with very dark brown or black scales having many small and narrow silver spots and stripes, as follows: head with spots at apex of palps, base of antennae and other places; mesonotum with two conspicuous lateral stripes curved so that both form a lyre-shaped pattern, with fainter mesal stripes and three white spots on scutellum; pleurae with several patches of silver scales; abdomen with a narrow white basal band on each segment, with a conspicuous large silver spot on the lateral portion of each tergite, and with the sternites forming a narrow whitish area between these; hind tibiae with a broad white band at the base of each segment, middle and front legs with white bands on only the basal two segments; tibiae black; femora with small white kneecaps and stripes of silver scales along the anterior faces and much of the ventral faces. Wings entirely dark scaled.

**MALE.**—Similar in size and color to female with the exception of the palps, which are very long, have no apical brushes, and have well-defined conspicuous white bands at the base of each segment. Male genitalia, fig. 134, with very broad robust basistyle, dististyle terminal and simple, and claspettes completely absent.

This species, the widespread yellow-fever mosquito of the South, has been taken at only one or two isolated points in Illinois. In this state it seems to be restricted to isolated small populations that occur as adventives. Apparently none of the introductions has persisted longer than a single summer. The records listed below from Edwardsville appear to be based on the introductions of adults with merchandise; probably no breeding or colonization resulted.

Apparently this mosquito, one of the most important vectors of yellow fever, does not occur in Illinois naturally and is not able to establish itself permanently even when introduced.



Figs. 159-167.—*Aedes* female genitalia. A, lateral aspect; B, ventral aspect; C, dorsal aspect. Abbreviations: c, cercus; p, postgenital plate; s, sternite; t, tergite. Fig. 167B shows only the postgenital plate.



**Illinois Records.**—BELLEVILLE: Aug. 6, 1942, C. J. Rohde, 1 ♀ (USPHS); Aug. 26, 1942, chicken coop, 1 ♀ (USPHS). EDWARDSVILLE: Sept. 24, 1943, biting in shop, Ross & Sanderson, 4 ♀; Oct., 1943, Ross & Sanderson, 1 ♂, 6 ♀. WATERLOO: Sept. 14, 1942, J. Williams, 1 ♀ (USPHS).

### Subgenus *Aedimorphus* Theobald

#### 3. *Aedes vexans* (Meigen)

**LARVA.**—Fig. 102. Head with upper hairs sometimes triple, sometimes quadruple, lower hairs double or triple, both of moderate length and without tufts between them. Eighth segment with comb variable, ranging from 6 to 12 teeth arranged in a scattered single row or an irregular double row. Air tube three and one-half to four times as long as wide; hair tuft short, usually quadruple, situated well beyond the pecten; pecten with 17 to 25 teeth, the basal teeth small, one to three apical teeth very large, widely separated from the remainder of the pecten, and, if more than one, from each other. Anal segment with sclerotized ring not complete ventrally; anal gills longer than ring, tapering gradually and pointed at apex, sometimes nearly as long as the air tube.

**FEMALE.**—Length of wing 4.5 mm. Head variegated with gray and brown, palps mostly brown-and-black scaled, with a small patch of white scales at apex. Mesonotum almost uniformly dark-brown scaled except for irregular posterior and lateral patches of gray scales. Abdomen with dorsum conspicuously banded, each segment with a basal white band and an apical bluish-brown band; the apical tergites frequently have an additional narrow white band of scales and the basal white bands are usually very narrow on the meson; venter of abdomen almost entirely white scaled. Legs, fig. 127, with tarsi black, each segment with a basal white band; these white bands may be extremely narrow on all the segments but are always conspicuous on the posterior tarsal segments and may occupy a quarter of the length of each segment. Wings entirely bluish-brown scaled.

**MALE.**—In size and color similar to female, differing chiefly in the long palps, which have a white-scaled band at the base of each segment. Genitalia, fig. 133, readily distinguished by the following characteristics: basistyle with only an inconspicuous

basal swelling; dististyle with the apical spine prominent and arising a short distance from the apex, this spine and the pointed apex usually appearing as a fork; claspettes short and surmounted by a tuft of short setae.

The commonest mosquito in Illinois in point of numbers throughout the warmer months of the year, *Aedes vexans* has a range that blankets the entire state. It is a vicious biter and breeds in a wide variety of temporary pond situations. Especially abundant after the summer rains, when it emerges in clouds from many types of rain pools and the flooded edges of marshes, *vexans* is the greatest mosquito nuisance in the state. To date the species is not known to transmit human diseases.

There is a great deal of literature on this mosquito. Formerly it was recorded as *sylvestris* Theobald. Holarctic in distribution, it does not extend in numbers into the extreme southern United States but is abundant at least as far south as southern Illinois.

The species may have several generations each year. The first brood of adults typically emerges in early spring, a week or so after emergence of *canadensis* and *sticticus*.

**Illinois Records.**—Larvae, collected April 3 to September 9, and many males and females, collected April 5 to October 26, are from Algonquin, Allendale, Altamont, Amboy, Antioch, Arcola, Baker, Beach, Belleville (USPHS), Benton, Bensenville, Billett, Bishop, Bourbonnais, Cache, Cahokia (USPHS), Cairo, Calvin, Camp Ellis (USPHS), Camp Grant (USPHS), Carbonale (USPHS), Carterville (USPHS), Cary, Casey, Cave-in-Rock, Central City, Champaign, Channel Lake, Chanute Field (USPHS), Charleston, Chebanse, Chemung, Chester, Chicago, Cordova, Danville, Darwin, Del Rio, Des Plaines, Downs, Duncans Mills, Dupo, East Dubuque, East Moline (USPHS), East Peoria (USPHS), East St. Louis, Edwardsville, Effingham, Eichorn, Eldorado, Elgin, Elizabethtown, Elsau, Epworth, Farmer City, Fort Massac State Park, Fox Lake, Fox Ridge State Park, Frankfort, Franklinville, Fulton, George Field (USPHS), Gilman, Glencoe, Golconda, Gorham, Gossett, Grafton (USPHS), Grand Tower, Granite City (USPHS), Grantsburg, Grass Lake, Grayslake, Grayville, Great Lakes Naval Training Station, Halfday, Hamel, Hardin, Harding, Havana, Hazel Crest, Hebron, Herod, Herrin, Homer, Horse Shoe Lake, Jerseyville, Joetta, Johnston City (USPHS), Joliet, Kampsville, Kankakee, Kappa, Karnak, Keensburg, Keithsburg, La Grange, Lake Bluff, Lake Fork, Lake Glendale, Lake Villa,

La Rue, La Salle, Lawrenceville (USPHS), Libertyville, Lincoln, Mahomet, Makanda, Marissa, Mascoutah, Mattoon, Mazon, McHenry, Metropolis, Mill Shoals, Mississippi Palisades State Park, Momence, Monticello, Morris, Mount Carmel, Mount Vernon, Mount Zion, Muncie, Neoga, New Boston, New Haven, New Holland, Northmoor, Oak Park, Oakwood, Oilfield, Olney, Oregon, Orland Park, Oswego, Palatine, Palestine, Palos Park, Patton, Pecatonica, Pembroke, Peoria (USPHS), Pere Marquette State Park, Pike, Pingree Grove, Pittsfield, Princeton, Quincy, Ravinia, Reynoldsville, Richmond, Ridge Lake, Rising Sun, River Forest, Robinson, Rockford, Rock Island (USPHS), Rockton, Rosecrans, Rossville, Round Lake, Roxana, Russellville, St. Charles, St. Jacob, St. Joseph, Salem, Sandoval, Savanna (USPHS), Scott Field, (USPHS), Seneca (USPHS), Seymour, Shawneetown, Skokie, Springfield, Starved Rock State Park, Sugar Grove, Sullivan, Thomson, Urbana, Utica, Venedy Station, Vienna, Viola, Volo, Wadsworth, Waltersburg, Ware, Watseka, Wauconda, Waukegan, Wedron, West Vienna, Wetaug, White Heath, White Pines Forest State Park, Willow Springs, Winnetka, Wolf Lake, Woodstock, Yorkville, and Zion.

#### Subgenus *Taeniorhynchus* Arribáizaga

##### 4. *Aedes sollicitans* (Walker)

**LARVA.**—Fig. 98. Head fairly wide, with short, tufted preantennal hairs and usually single (rarely double) upper and lower hairs, the lower hairs almost directly anterior to upper ones and without intervening tufts. Eighth segment with comb forming an irregular scattered triangle, composed of about 14 to 20 small scales. Air tube short and robust, two to two and one-half times as long as wide; hair tuft multiple branched, situated beyond pecten, and of moderate length; pecten forming a close and even series of about 20 teeth, the apical two or three usually more widely separated than the others. Anal segment completely ringed with sclerotized plate; anal gills very short, budlike.

**FEMALE.**—Length of wing 4.5 mm. Beak black, with a wide white band near middle, palps black tipped with white, dorsum of head golden. Mesonotum predominantly golden-brown scaled, the lateral areas and sometimes a mesal stripe darker brown. Pleurae with many white scales. Abdomen with tawny scales forming a fenestrated pattern made up of narrow basal bands and a wider mesal band of tawny scales against a blue-black background, very similar to

fig. 119; lateral portions of tergites each with a patch of white scales contrasting noticeably with the tawny scales; venter with a mixture of white and tawny scales. Legs, fig. 130, for the most part with a salt-and-pepper mottling of tawny scales and black scales; tarsi definitely banded with the apical portion black scaled, the basal portion white scaled. Hind tarsi with apical segment almost entirely white scaled, second, third, and fourth segments each with a basal band of white scales that cover a third to a half of the segment; basal segment with a basal band of white scales and a central band of tawny scales, the latter about as long as half the segment. Wings with a mottled appearance, the scales along all the veins being a salt-and-pepper mixture of dark scales and light scales.

**MALE.**—Similar in general to female with the following differences: beak without a definite band, the apical two-thirds being chiefly tawny scaled; palps very long and with distinct apical brushes, the basal segment being mostly tawny scaled. Male genitalia, fig. 138, of a very simple type. Basistyle nearly parallel sided, with a slight indication of a basal lobe, bearing at this point a cluster of hairs. Claspettes of moderate length, with a long apical blade curved at apex.

This species was recorded from Illinois by Chandler (1920) and by Matheson (1930), and has since been taken at a few scattered localities. Each occurrence has been associated with salt water from mine or oil well drainage. In two instances, at Dupo and at Central City, the species occurred in tremendous numbers. The severe and persistent biting led in each case to the organization of local control measures. In the Dupo area the salinity of water in which breeding occurred was three times the average for ocean water.

Like *vexans*, this species is an intermittent breeder. The eggs, which are laid in dry places, hatch at subsequent floodings, and there are new outbreaks of adults following most summer rains. The larvae develop very rapidly after hatching, and a wave of adults follows in quick succession.

**Illinois Records.**—Many larvae, collected March 18 to October 27, and adults, collected April 29 to October 14, are from Benton, Cahokia (USPHS), Carterville (USPHS), Central City, Centralia, Chanute Field (USPHS), Crab Orchard Lake (USPHS), Dupo, Granite City (USPHS), Herrin, Johnston City (USPHS), Law-

renceville (USPHS), Mount Vernon (USPHS), Savanna (USPHS), Scott Field (USPHS), West Frankfort, White City (USPHS), and White Heath (USPHS).

### 5. *Aedes nigromaculis* (Ludlow)

**LARVA.**—Head similar to that of *sollicitans*, having upper and lower head hairs single. Eighth segment with comb forming an irregular scattered triangle composed of 14 to 20 scales. Air tube short and robust, two to two and one-half times as long as wide; hair tuft beyond pecten multiple branched and short; pecten occupying most of the length of the tube with several conspicuously detached teeth at the apex. Anal segment completely encircled by sclerotized ring. Anal gills twice as long as anal segment, pointed, representing the chief difference between this species and *sollicitans*.

**ADULTS.**—In length and color almost identical with those of *sollicitans*, differing in the coloration of the abdomen, in which the dorsal, mesal, and lateral bands of pale scales are all practically pure white. The width of the white band on the beak and the central band of pale scales on the hind basitarsus both vary considerably, sometimes represented by only a few pale scales. No characters have yet been found to separate satisfactorily the male genitalia of *sollicitans* and *nigromaculis*.

A western species, *nigromaculis* has so far been taken only once in Illinois. A single female was caught in the light trap at the Savanna Ordnance Depot, July 7, 1945, and collected by S. Mittler. This record was first discovered by Captain Charles F. Gerlach, U. S. Public Health Service, to whom I am greatly indebted for information regarding it.

No larvae of this species have yet been taken in the state. The species frequents saline pools throughout the great plains area and westward.

### 6. *Aedes mitchellae* (Dyar)

**LARVA.**—Head similar to that of *sollicitans*. Eighth segment with comb more compact than in *sollicitans*. Air tube somewhat slender, more than three times as long as wide; hair tuft usually seven branched, situated beyond pecten; pecten composed of a close row of small teeth. Anal segment completely ringed by sclerotic shield; anal

gills slender and pointed, slightly longer than anal segment (after Dyar).

**FEMALE.**—Similar in size and almost all particulars of color and structure to the female of *sollicitans*, differing chiefly as follows: hind basitarsus having no center band of tawny scales, being black scaled with a basal band of white scales; tibiae predominantly black with a conspicuous scattering of white scales on the anterior face; wings entirely dark scaled.

**MALE.**—Genitalia, fig. 136, very similar in most particulars to those of *sollicitans*, differing chiefly in the round and projecting basal lobe. The setae on this lobe are longer than in *sollicitans*.

This species is primarily southeastern in distribution. Our only record for Illinois is a single female collected on the south side of Chicago, May 18, 1906, by Charles A. Hill; it was recorded as *Aedes taeniorhynchus* (Wiedemann) by Gerhard in 1910. The lack of subsequent records indicates strongly that it represents an adventive. The specimen probably came north by train.

### Subgenus *Aedes* (Meigen)

#### 7. *Aedes cinereus* Meigen

**LARVA.**—Fig. 101. Head wide and relatively short; upper and lower hairs each with four to seven filaments, the lower hair almost directly laterad of the upper hair and only slightly anterior to it; no accessory tuft between or in front of upper and lower pairs. Eighth segment with comb forming an irregular line or an irregular triangle of 10 to 15 large well-separated teeth. Air tube moderately elongate, about four and one-half to five times as long as wide; hair tuft short, usually quadruple, situated beyond pecten; pecten with about 14 teeth, the basal ones very small, the apical ones very long and widely separated. Anal segment with the tergite encompassing only about one-half the segment; anal gills slender and sharp, about as long as the air tube.

**FEMALE.**—Length of wing 4 mm. Head, including beak and palps, dark brown to black. Mesonotum entirely reddish-brown scaled with a few postero-lateral and postero-mesal areas of grayish scales. Abdomen with dorsum almost entirely bluish-black scaled, the base of each segment with a narrow crescent of cream scales at the base; venter of abdomen almost entirely white or cream scaled. Legs with tibiae and

tarsi entirely bluish-black scaled, the femora with the anterior faces usually dark, the posterior faces whitish. Wings entirely dark scaled.

**MALE.**—In size and general color similar to female. Palps represented by short stubs, very similar to those of the female and entirely unlike those of any other Illinois species of the genus. Abdomen with basal white bands more pronounced than in the female. Male genitalia, fig. 135, differing from all others in the genus by the following distinctive characters: dististyle inserted some distance from the apex of the basistyle; dististyle with prominent sclerotized processes at base and having apex divided into a Y-shaped fork; basistyle with a pointed, projecting apex, a broad base bearing a sharp basal lobe, and also a branched sclerotized mesal lobe; claspettes entirely lacking.

This mosquito, which is crepuscular and a ready biter in the vicinity of its larval habitat, is common in the many small water holes that abound in the glacial bogs and marshes in the northeastern corner of the state. Apparently it produces annually only one generation, which emerges in late May or early June.

*Aedes cinereus* was formerly known under the name of *fuscus* Osten Sacken, and a specimen was so recorded from Glen Ellyn, Illinois, May 30, 1908, by Gerhard (1910). In addition to many records of the species from northeastern Illinois, we have scattered records from other parts of the state, especially the southern fourth. The records from southern Illinois were associated with (but not reared from) woodland pools.

**Illinois Records.**—Antioch, Cahokia (USPHS), Cairo (USPHS), Camp Grant (USPHS), Carterville (USPHS), Crab Orchard Lake (USPHS), Chemung, Elgin, Glencoe, Gorham, Great Lakes Naval Training Station, Kankakee, Keithsburg, Lawrenceville (USPHS), Pingree Grove, Ravinia, Roxana, Scott Field (USPHS), Skokie, Springfield (USPHS), Volo, Wauconda, Waukegan, and Zion.

#### Subgenus *Ochlerotatus* Arribáizaga

##### 8. *Aedes excrucians* Walker

**LARVA.**—Fig. 103. Length 10 mm. Head wide. Lower head hairs usually double, upper head hairs usually triple, but frequently double, and any of the four occasionally single. No accessory hairs or tufts between them. Air tube elongate, about

five times as long as wide; pecten with one to three apical teeth detached, ventral tuft situated beyond the pecten and very long. Lateral comb consisting of an irregular patch of about 25 scales. Anal segment with dorsal shield covering little more than one-half the segment, the anal gills about as long as the segment, narrow and tapering.

**FEMALE.**—Length of wing 6 mm. In color and general characteristics, this species is very similar to *stimulans*, differing as follows: mesonotum usually with much more extensive reddish-brown areas and meso-epimeron without bristles.

**MALE.**—In color and general structure similar to male of *stimulans*. Genitalia, fig. 155; similar in general proportions to those of *stimulans* but differing markedly as follows: ventral aspect of basistyle seeming to have basal lobe projecting as a triangular area; in reality the basal lobe is a large and somewhat rectangular area folded back against the mesal face, covered with rows of short fine setae and without any indication of a macrochaeta.

To date we have found this species in only the northeastern corner of the state, where it inhabits the spring pools in some of the marshes and bogs. It appears to favor marsh situations that border woods and is found usually in company with *stimulans* and *fitchii*. It has only a single generation per year, and its habits are very similar to those of *stimulans*. We have never found it in Illinois in the tremendous numbers that characterize colonies of *stimulans*. Matheeson (1930) recorded the species from several localities in northeastern Illinois. In addition, he gave a record from Urbana, which is in the central part of the state; this specimen, however, appears more like *fitchii*, although it is in very poor condition and does not provide a good basis for a definite record.

*Aedes excrucians* is Holarctic in distribution. In North America it is restricted to the northern coniferous forest belt and areas a short distance southward. Our Illinois records appear to be on the southern limit of its range in this longitude.

**Illinois Records.**—BEACH: June 10, 1933, Mohr & Townsend, 1♀. ELK GROVE: May 2-6, 1942, 11♂, 21♀, 6 larvae. VOLO: April 24, 1942, Ross & Burks, April 29, 1942, Ross & Samuels, 12 larvae; May 4-5, 1942, Ross & Burks, 1♀, 5 larvae. WADSWORTH: June 3, 1943, Ross & Sanderson, 8♂; June 10, 1942, Ross & Sanderson, 17♂, 1♀. WAUCONDA:

April 21, 1942, Ross & Riegel, 1 larva; April 29, 1942, 3 ♂.

### 9. *Aedes flavescens* Müller

**LARVA.**—Head wide, upper and lower hairs multiple, the upper ones sometimes double. Eighth segment with comb forming a triangular patch of scales. Air tube over three times as long as wide, the pecten reaching the middle, with the last two teeth detached. Anal segment with dorsal plate covering only the dorsal half of the segment. Anal gills as long as the anal segment and tapering to a point.

**FEMALE.**—Length of wing 7 mm. Head and mesonotum golden brown with areas shading to a more yellowish cast. Beak and palps black with white scales scattered along the entire length. Dorsum of abdomen entirely cream scaled. Legs, except for the tarsi, mostly cream scaled. Basitarsus a mixture of white and black scales, the apical tarsal segments with the basal halves entirely white scaled, the apical halves dark scaled. Wings almost entirely cream scaled with a few black scales mixed in with them.

**MALE.**—In size and general color similar to female, palps with an apical brush. Genitalia, fig. 152, as follows: apical lobe large and projecting; basal lobe large and triangular, with many short setae and a single large conspicuous macrochaeta; claspette having a short stout base with fairly long apical filament, and beyond this a long narrow neck and enlarged apical head which tapers to a narrow tip.

To date we have taken only isolated adults of this species from the state, all from the northeastern portion, from near the Wisconsin border to Kankakee, some 100 miles farther south. The males we took in the vicinity of marshes in which the larvae probably breed.

Our records for this species, which is Holarctic in distribution, are on the southern edge of its range. The Illinois records given by Matheson (1930) for this species from Algonquin prove to be for *fitchii*, but our present records from Franklinville and Woodstock are close to Algonquin. The species is believed to have only one generation per year and the adults seldom are abundant enough to be a nuisance.

**Illinois Records.**—ANTIOCH: May 21, 1941, 1 ♂, 1 ♀. FRANKLINVILLE: June 4, 1943, marsh

pond, Ross & Sanderson, 1 ♂. KANKAKEE: Aug. 4, 1938, Burks & Boesel, 1 ♀. WOODSTOCK: June 4, 1943, cattail marsh, Ross & Sanderson, 1 ♂. ZION: June 19, 1941, 1 ♀; June 10, 1942, Mohr & Burks, 1 ♀.

### 10. *Aedes stimulans* Walker

**LARVA.**—Fig. 104. Length 9 mm. Head wide, lower head hairs usually single, rarely double, upper head hairs usually double but occasionally single, triple, or quadruple. Eighth segment with lateral comb forming a rough triangle of about 30 scales. Air tube about three and one-half times as long as wide; pecten composed of an even series, the ventral tuft situated beyond it, usually three haired, and longer than width of segment at base of tuft. Dorsal shield covering little more than half of segment; gills pointed and usually slightly shorter than segment.

**FEMALE.**—Length of wing 6 mm. Beak and palps with a mixture of brown scales and white scales. Mesonotum varying from grayish brown to reddish brown, with gray-scaled stripes or areas along the lateral half and always nearly covering the scutellum. Mesopleurae with a group of three to six epimeral bristles. Dorsum of abdomen mostly dark scaled, each segment with a basal band of white scales, the bands small and crescentic on the basal segments, becoming wider and more extensive toward the apex. Hind tarsi with basal segments mostly white scaled; second, third, and fourth dark scaled with a basal white band occupying about a third of the segment. Wings mottled with brown scales and white scales, the dark ones predominating.

**MALE.**—Similar to female in color and structure. Palps with apical brushes. White bands on abdomen usually much more extensive. Male genitalia, fig. 153: basistyle with well-developed apical lobe; basal lobe developed as a large mesal lobe bearing many short setae and a large macrochaeta, but projecting only slightly as seen from ventral view; claspette curved and narrow, its apical filament elongate with a long slender base, a sharp upper projection near middle, and from this point gradually tapering to a slender curved tip.

Three *Aedes* species, *stimulans*, *excrucians*, and *fitchii*, form a group the females of which are frequently difficult to identify. The characters given in the key are not infallible, but will serve to separate most

specimens. Characters of larvae and of male genitalia offer very satisfactory means of diagnosis.

*Aedes stimulans* occurs in tremendous numbers in and near woodland pools and stump holes in the northeastern corner of Illinois. The larvae, which appear shortly after the annual spring thaw, develop slowly, but are usually full grown by the time the first warm weather of late May occurs. The adults soon emerge, and during June and early July many woods in the vicinity of northeastern Illinois are teeming with ferocious biters. The species has only one generation per year. Outside of the northeastern corner of the state, we have records of isolated colonies as far south as the central portion of the state. Early records of about 1906 and 1910 indicate that this species may have been much more abundant in central Illinois during the early part of the century, before so many extensive tracts of upland timber were cleared.

The range of *stimulans* is widespread throughout the northeastern states, across the north central states, through Canada, and into the Yukon. Illinois is on the southern limit of its range.

**Illinois Records.**—Larvae, collected April 15 to April 25, and adults, collected April 28 to July 20, are from Algonquin, Antioch, Bensenville, Bishop, Camp Grant (USFHS), Elk Grove, Glencoe, Gurnee, Halfday, Highwood, Mokence, Muncie, Northmoor, Palatine, Princeton, Ravinia, River Forest, Rockford, Rock Island, Rondout, Rosecrans, Starved Rock State Park, Urbana, Utica, Volo, Wadsworth, Waukegan, Yorkville, and Zion.

### 11. *Aedes fitchii* Felt & Young

**LARVA.**—Fig. 109. Length 9 mm. Head wide, lower hairs usually double, occasionally single or triple, upper hairs usually triple, occasionally double, and rarely quadruple. Lateral comb somewhat triangular, composed of about 25 scales. Air tube elongate, about five times as long as its width near middle of pecten, tapering markedly and gradually from base to apex; pecten consisting of 20 to 25 scales forming an even row; ventral tuft situated just beyond pecten and very long. Anal segment with dorsal shield covering nearly two-thirds of segment; anal gills longer than segment and pointed.

**FEMALE.**—Length of wing 6 mm. Color and general structure in general as for *stim-*

*ulans* with the following diagnostic features: head gray, mesonotum with the mesal third bright reddish brown, the lateral third hoary gray with a few reddish-brown scaled areas, scutellum gray; meso-epimeron usually with only two bristles.

**MALE.**—In size and general color similar to female. Genitalia, fig. 154: basistyle with projecting rod, apical lobe bearing a scattering of long setae projecting mesad; basal lobe large and bearing a dense cluster of very fine long setae, in addition to the basal macrochaeta. Claspette with basal portion nearly straight, the apical filament short and curved, bladelike, and with its underside notched at the extreme base.

Both Gerhard (1910) and Matheson (1930) recorded this species from Illinois. Most of our recent records for it are from the northeastern corner of the state. Here the species breeds in abundance in practically every open marsh. It is usually found associated with *Culiseta inornata* or *Aedes excrucians*, but in some marshes it occurs as a pure colony. Our only records south of northern Illinois were obtained by Hart from Urbana in 1887 and from Havana in 1892. We have a recent record taken from Savanna, which is in the extreme northwestern part of the state. The species has apparently only one generation per year.

Our Illinois records appear to be on the southern limit of the range of this species, which has a wide northern distribution similar to that of *stimulans*.

**Illinois Records.**—Larvae, collected April 29 to June 10, and adults, collected May 3 to October 5, are from Algonquin, Antioch, Elk Grove, Franklin (Cook County), Franklinville, Glencoe, Great Lakes Naval Training Station, Halfday, Lake Bluff, Orland Park, Palos Park, Ravinia, River Forest, Sand Lake, Savanna, Urbana, Volo, Wadsworth, Waukegan, Willow Springs, Woodstock, and Zion.

### 12. *Aedes thibaulti* Dyar & Knab

**LARVA.**—Head, fig. 97, wider than long; preantennal and both upper and lower head hairs long, the lower head hairs usually quadruple, the others with five or more branches; clypeal hairs very wide apart, three-quarters as far apart as distance between upper head hairs; lower head hairs considerably laterad of and only slightly anterior to upper hairs; antennae very long, over three-quarters as long as head, antennal tuft very long. Eighth segment with comb

consisting of a trianguloid patch of scales. Air tube about four and one-half times as long as wide, with pecten consisting of about 20 scales arranged in an even row, ventral tuft situated just beyond pecten, usually six branched, the branches longer than the greatest width of the tube. Anal segment with dorsal shield longer than wide, covering about two-thirds of the segment; anal gills about as long as segment, tapering to a blunt tip.

**FEMALE.**—Length of wing 4 mm. Beak and palps black, head gray. Mesonotum, fig. 122, with a bluish-black mesal patch that is narrow on the anterior half of the mesonotum but that on the posterior half occupies nearly the entire width of the segment. Antero-lateral areas of the mesonotum are a bright gray, with scales long and slender and not forming a shingled patch; abdomen bluish black with small white lateral patches at the bases of most of the segments; legs with tibiae and tarsi entirely black, femora with anterior and apical portions black, with conspicuous white knee rings and white basal areas; wings entirely brownish-black scaled.

**MALE.**—Similar in size and color to female; palps very long and with apical brushes. Male genitalia, fig. 139, with broad basistyle that has a prominent apical and basal lobe and peculiar claspettes; the claspette blade is contorted into a somewhat irregular hook-shaped structure unlike that of any other North American species in the genus. Otherwise, the species shows a marked affinity to *trivittatus*, on the basis of the small but definite apical and basal lobes of the basistyle.

Published records indicate that this species is primarily a south central species and has been found in abundance in Arkansas. The Illinois records represent the most northern locality in which the species has been taken. An excellent account of its life history is given by Horsfall (1940). It usually breeds in holes within the bases of standing trees. It seems to prefer swamp situations and, according to some writers, shows a marked preference for the bases of sweet gum and tupelo gum trees.

**Illinois Records.**—CAHOKIA: June 29, 1943, Snow, 1♂ (USPHS). CARTERVILLE: June 27, 1942, 1♀ (USPHS); May 31, 1944, 1♀ (USPHS). MARION: June 2, 1942, Johnson, 1♂ (USPHS). SCOTT FIELD: June 25, 1942, 2♀ (USPHS); June 16, 1943, 2♀ (USPHS); June 18, 1943, 1♀ (USPHS).

### 13. *Aedes grossbecki* Dyar & Knab

**LARVA.**—Fig. 113. Length 10 mm. Head wide, lower hairs usually double or triple, upper hairs usually triple, sometimes double or quadruple. Lateral comb of segment 8 forming a triangular patch consisting of about 30 scales. Air tube three and one-half times as long as wide, tapering only slightly; pecten teeth forming an even row; ventral tuft situated just beyond pecten and as long as, or slightly longer than, width of air tube at base of tuft. Anal segment with dorsal shield covering about one-half of segment; anal gills about as long as segment and tapering.

**FEMALE.**—Length of wing 5 mm. Beak and palps black, with scattered white scales, each palp with a small tuft of white scales at apex; dorsum of head covered with gray and white scales. Mesonotum with an irregular pattern, fig. 118, the lateral area white scaled, the mesal third of the anterior half bright brown scaled and the major portion of the disc of the posterior half black scaled, the posterior border white scaled; these areas are variable and merge one into another. Dorsum of abdomen irregularly scaled, the ground pattern dark scaled with a scattering of white scales, and each segment with an arcuate basal area of white scales. Legs, fig. 124, mostly white scaled, the middle and posterior pair with irregular areas of black scales; hind tarsi banded, segments 2 to 5 with basal third to half white scaled, apex black scaled, basitarsus mostly white scaled but not definitely banded. Wings with a mixture of white scales and black scales. All the wing scales are very wide, fig. 169, a characteristic that sets off this species from all other Illinois members of the genus.

**MALE.**—In size, color, and wing scaling similar to female. Palps with large apical brushes. Male genitalia, fig. 157: basistyle with projecting apical lobe bearing several rows of hairs curved dorsad; basal lobe wide and steplike, the macrochaeta somewhat isolated on the ventral edge, the remainder with a cluster of long setae; claspettes with base curved, apical filament with a slender base and an expanded apex that tapers to a curved sharp tip.

Although not abundant, this species is common throughout the post oak flats along the Mississippi River in extreme southern Illinois. Outside this area only isolated

specimens have been taken, but these extend the known range in the state north as far as Chicago. The only Chicago record is that of Gerhard (1910), who recorded a male from Chicago and a female from Palos Park under the name *Aedes sylvicola* Grossbeck (now considered a synonym of *grossbecki*). The adults of *grossbecki* emerge early in the spring and apparently have only one generation per year. Outside of Illinois the species has been recorded from only a few localities to the South. We have encountered the adults in the field so rarely that we know little of their habits.

**Illinois Records.**—Several larvae, collected April 3, and adults, collected April 6 to June 17, are from Cache, Crab Orchard Lake, Gorham, Grand Tower, La Rue, Mount Vernon, Reynoldsville, St. Jacob, Urbana, and Ware.

#### 14. *Aedes trivittatus* Coquillett

**LARVA.**—Fig. 108. Head fairly wide, upper and lower head hairs always long and single; preantennal hair short and eight-branched; accessory hairs absent. Eighth segment with a triangular comb consisting of short pointed scales. Air tube fairly short and robust, about two and one-half times as long as wide; hair tuft fairly short and six to eight branched, situated beyond apex of pecten; pecten consisting of about 15 fairly long teeth arranged in an almost perfectly regular row. Anal segment completely ringed by sclerotic plate; anal gills long and tapering, frequently twice length of anal segment.

**FEMALE.**—Length of wing 5 mm. Beak and palps black, dorsum of head white scaled. Mesonotum, fig. 115, with a long dark central wedge, flanked on the side by a wide stripe of white scales; the anterior portion of the mesonotum has a dark stripe laterad of the light stripe. Dorsum of abdomen almost entirely dark scaled with small lateral triangles of white scales on the apical segments; venter almost entirely white scaled with black lateral triangles on basal segments. Femora pale scaled with stripes of black scales on apical areas; tibiae and tarsi dark scaled with narrow lines of whitish scales on the ventral edge; wings entirely dark scaled.

**MALE.**—In size and color similar to female. Male genitalia, fig. 151: basistyle with apical lobe only moderately developed, shoulderlike; basal lobe steplike, with a



Fig. 168.—Portion of wing of *Aedes stimulans*.

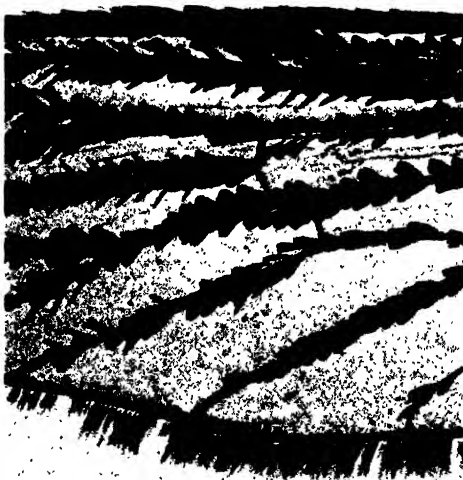


Fig. 169.—Portion of wing of *Aedes grossbecki*. Note the wide scales on the veins compared with those of fig. 168.

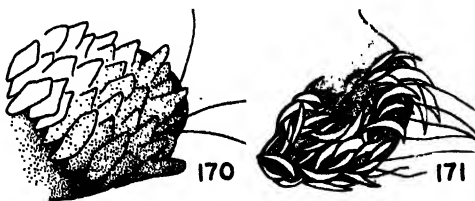


Fig. 170.—*Aedes triseriatus*, scales on pronotal lobe, lateral aspect.

Fig. 171.—*Aedes thibaulti*, scales on pronotal lobe, lateral aspect.



very sinuate macrochaeta and many long slender setae. Claspette curved, its apical filament with a definite neck and head, the back of the head produced into one to several spinelike barbs, the tip slender and slightly hooked.

The male of this species is very similar in many respects to that of *infirmatus* Dyar & Knab. In *infirmatus*, fig. 150, the macrochaeta of the basal lobe has a definite thickened angle near the base, the basal lobe itself is diagonal to the main axis of the basistyle, and the basistyle is more slender. The claspettes of the two species are very similar.

*Aedes trivittatus* is one of the extremely annoying species encountered in Illinois. It is a fierce biter, even in the day time, and occurs in a wide variety of temporary pool situations. The adult emergence apparently occurs principally during the late spring, generally later than that of *sticticus* and *canadensis* and frequently coinciding with that of *vexans*. The larvae have been found in shady woodland pools usually resulting from spring rains or spring floods. In our recent collecting, the adults have been encountered in great numbers many times, but the larvae have been taken very seldom and only in small numbers.

In Illinois this species is distributed fairly uniformly over the entire state. Its range covers the northeastern and north central states with a few records extending into the southern states.

**Illinois Records.**—Larvae, collected May 8 to September 17, and many males and females, collected May 4 to November 29, are from Antioch, Baker, Cahokia (USPHS), Camp Grant (USPHS), Carterville (USPHS), Champaign, Chicago, Crab Orchard Lake (USPHS), Danville, Des Plaines, East Peoria (USPHS), East St. Louis, Edwardsville, Glencoe, Great Lakes Naval Training Station, Halfday, Havana, Herod, Homer, Joetta, Kappa, Keithsburg, Lake Fork, Mascoutah, Matanzas Lake, Momence, Muncie, Neoga, New Boston, Oakwood, Pere Marquette State Park, Princeton, Ravinia, St. Jacob, Savanna (USPHS), Scott Field (USPHS), Seneca (USPHS), Seymour, Springfield, Starved Rock State Park, Sycamore, Urbana, Utica, Wadsworth, Ware, Weldon Springs, and Zion.

### 15. *Aedes aurifer* Coquillett

**LARVA.**—Fig. 100. Head wider than long, clypeal bristles moderately far apart. Antennae very long, nearly as long as length of

head, the tuft distinctly beyond middle of antennae and the apical portion markedly more slender than the basal portion. Upper and lower head hairs usually double, occasionally one of them triple, each lower head hair at least twice as far laterad as it is antieriad of upper head hair. Eighth segment with comb varying from an irregular single or double row of about 10 scales to an irregular patch of about 20 scales. Air tube nearly four times as long as greatest width; pecten with 12 to 20 scales, the basal ones very short and broad, the apical 2 or 3 detached from the remainder; ventral tufts multiple and markedly longer than greatest width of tube. Anal segment not completely ringed by sclerotized plate, but with a ventral membranous strip about as wide as in fig. 110B. Gills tapering and of moderate length.

**FEMALE.**—Length of wing 4 mm. Beak and palps black, head varied with golden and dark brown. Mesonotum, fig. 123, having a large central purplish-black area with narrow lateral areas of gray scales shading to gold where the lateral and mesal areas meet, scutellum with a small gray area flanked on each side with a short and very narrow golden line. Dorsum of abdomen almost entirely bluish black, the lateral portion of each tergite having a white patch just visible from dorsal view. Legs with tibiae and tarsi almost entirely blue black, some of the scales gray; femora with apical and dorsal portions black, extreme apex of each with a small white knee spot, basal portion cream. Wings entirely bluish-black scaled.

**MALE.**—In size, color, and general structure similar to female. Palps with a large apical brush. Male genitalia, fig. 141: basistyle moderately narrow with a large tuft of long conspicuous setae at apex; apical lobe set off as a shoulder, its dorsal margin with an irregular linear area of setae curving dorsad; basal lobe represented by a detached sclerotized plate on the mesal face of the basistyle, this sclerite with a scattering of short setae and a single large dorsal macrochaeta arising from the dorsal margin; claspette with a short curved base, the apical blade long, bearing a large barb on its upper surface and tapering to a slender curved apex.

The male genitalia of this species are of the same type as those of *intrudens* Dyar, fig. 142. The two differ somewhat in details

of the claspette and apical tuft of the basistyle, but more particularly in the basal lobe. In *intrudens* the basal lobe bears three macrochaetae, one at the extreme base and two on the dorsal margin.

The range of *aurifer* extends throughout the northeastern and north central states. We have only a single record of the species for Illinois, a female taken in the vicinity of a cypress swamp at Karnak, May 15, 1941, by Mohr & Burks. This specimen was collected considerably south of other *aurifer* records in the western portion of the range of the species. The distinctive color markings of this specimen check perfectly with the markings of specimens from Michigan and Rhode Island.

### 16. *Aedes dorsalis* Meigen

**LARVA.**—Head fairly wide; upper and lower head hairs long, always single, the lower hairs almost directly anterior to the upper ones and without intervening tufts. Eighth segment with comb triangular, composed of small sharp scales. Air tube moderately stout, two and one-half to three times as long as wide, hair tuft about six branched, situated beyond pecten; pecten with about 20 teeth forming an evenly spaced row. Anal segment with sclerotic shield covering only dorsal half of segment; anal gills very short and budlike.

**FEMALE.**—Length of wing 4.5 mm. Most of body and appendages cream to tawny scaled; beak tawny brown; mesonotum tawny; usually with a narrow brown mesal stripe and another brown stripe along each lateral margin, fig. 119, sometimes with additional narrow brown stripes and sometimes without any brown stripes; abdomen cream scaled, the basal segments usually each with a pair of lateral spots of dark scales. Legs mostly cream scaled with a mixture of black scales, especially toward the apexes of the femora; tarsi mostly black scaled with a white fringe at the base and apex of each segment. Wings cream scaled, usually but not always with an irregular mixture of black scales on most of the veins.

**MALE.**—In color similar to female except that the brown stripes on the mesonotum are usually darker and wider. The palps have apical brushes as in *canadensis*. Genitalia, fig. 145, as follows: basistyle with apical lobe only moderately developed and square shouldered; basal lobe projecting

and round, with one short and one long macrochaeta and with many slender setae; these setae are very short near the macrochaetae and increase in size to the dorsal margins of the lobe, fig. 145B; claspettes with slender bases, the apical filament of each angled near middle and tapering to a slender tip.

This species is similar in general appearance to *Aedes campestris* Dyar & Knab. The males, however, differ markedly in the setation of the basal lobe. In *campestris*, fig. 146, this lobe bears long setae of almost equal length over the entire surface and has only a single macrochaeta, which is little larger or longer than the other setae. The females are practically impossible to identify; in the past it has been considered that in *dorsalis* the third vein ( $R_{3+4}$ ) was almost entirely dark scaled whereas in *campestris* this vein was largely white scaled. Reared series from individual colonies have shown that this differentiation does not hold, since both extremes and various intermediate conditions occur in *dorsalis* alone.

The first Illinois reports of *dorsalis* were from the suburbs of Chicago and were recorded by Gerhard (1910) using the name *Aedes curriei* Coquillett, a name then in use for this species but since that time sunk as a synonym of the Holarctic *dorsalis*. The species was reported from Oak Park, Illinois, by Matheson (1930) as *Aedes dorsalis*. At the same time Matheson recorded four females of *Aedes campestris* from Riverdale, near Chicago, Illinois. There seems no doubt that these Riverdale specimens are true *dorsalis* and not *campestris*, because all males taken in the Chicago area have proved to be *dorsalis*, and these specimens come well within the range of variation of reared series from nearby localities.

Only a few colonies of *dorsalis* have been found in the state, and all have been associated with waters contaminated by industrial wastes. In southern Illinois, one colony occurred with *solicitans* in saline water from oil wells, and in northern Illinois other colonies were in the seepage areas from several factories. The species is an irregular, intermittent breeder, and usually a brood of adults emerges following each inundation by rain of the affected areas.

The adult females are fierce biters and appear to be predominantly crepuscular.

**Illinois Records.**—Larvae, collected April 22 to May 9, and adults, collected April 9 to

October 10, are from Cahokia (USPHS), Camp Grant (USPHS), Chanute Field (USPHS), Dupo, East Moline, East St. Louis, Great Lakes Naval Training Station, Oak Park, Riverdale, Savanna (USPHS), Scott Field (USPHS), and Summit.

### 17. *Aedes canadensis* Theobald

**LARVA.**—Fig. 105. Head wide; upper and lower hairs multiple, five to eight branched, similar in length and fanlike appearance to preantennal hairs. Eighth segment with comb somewhat triangular, composed of a large number of small scales. Air tube moderately slender, nearly four times as long as wide; hair tuft long, usually five branched; pecten forming an even row of about 15 teeth, the apical teeth slightly wider apart than the others. Anal segment with sclerotic shield covering only the dorsal half of the segment; anal gills tapering and pointed, about as long as the segment.

**FEMALE.**—Length of wing 4 mm. Beak and palps brown, the latter with a minute tuft of white scales at extreme tip. Mesonotum uniformly golden brown and with a few indistinct gray lines along lateral margins and on or near scutellum. Dorsum of abdomen dark scaled with an almost uniform narrow band of white scales at base of each segment. Tarsi each with a fairly wide band of white scales at both base and apex, tibiae almost entirely dark scaled, femora mostly white scaled with dorsal portions dark scaled. Wings uniformly bluish-brown scaled.

**MALE.**—Similar in size, color, and general characters to female, differing chiefly in the long palps, each of which extends beyond the beak and has a large apical brush embracing the last two segments and the apex of the preceding segment. The white bands on the dorsum of the abdomen are much wider than in the female. Genitalia, fig. 140: basistyle with large ovate apical lobes bearing a dense cushion of flattened wide setae, basal lobes wide and triangular, with a uniform brush of very slender setae and a larger single macrochaeta at base; dististyle elongate, with an apical seta; claspette moderately long and stout, with a slender sinuate filament.

This species, which is one of the most widespread in the state, has only one generation per year. The larvae mature early in

the season; the adults emerge in April and May. The species frequents chiefly woodland pools, especially those flooded by seepage water in the spring independent of high water in the streams. In southern Illinois, it occurs primarily in the post oak flats along the Mississippi. In other parts of the state it is found in stump holes, small sink holes, and isolated oxbows of small woodland streams. In rare instances it is found in practically unshaded situations.

The females are fierce biters and attack readily in shaded situations through most of the day. They live for many months, and, in woodland situations, isolated specimens are encountered well into the summer. To date the species has not been incriminated as a carrier of disease.

**Illinois Records.**—Larvae, collected March 18 to May 23, and many males and females, collected April 11 to August 1, are from Alpha, Altamont, Antioch, Bensenville, Benton, Cache, Camp Grant (USPHS), Carbondale, Carterville (USPHS), Casey, Centralia (USPHS), Cottage Grove, Crab Orchard Lake (USPHS), Danville, Darwin, Des Plaines, Effingham, Elgin, Elk Grove, Equality, Giant City State Park, Glencoe, Golconda, Gorham, Grand Tower, Grantsburg, Grimsby, Halfday, Herod, Ina, Johnston City (USPHS), Jonesboro, Kankakee, Karnak, La Rue, Marion, Mascoutah, Momence, Mount Vernon, Muncie, Oakwood, Raven, Ravinia, Reynoldsville, Rondout, St. Jacob, Salem, Scott Field (USPHS), Springfield, Starved Rock State Park, Urbana, Utica, Vienna, Volo, Wadsworth, Waltersburg, Ware, Waterloo, Wauconda, West Vienna, Willow Springs, Yorkville, and Zion.

### 18. *Aedes sticticus* (Meigen)

**LARVA.**—Fig. 107. Length 8 mm. Head with upper and lower hairs of only moderate length, usually two to four branched but occasionally with an odd hair single, the exact combination of branching extremely variable and frequently asymmetrical; lower head hairs almost directly anterior to upper hairs. Eighth segment with comb triangular, composed of small scales. Air tube fairly short, about two and one-half times as long as wide; hair tuft short, usually six branched; pecten with 15 to 20 teeth arranged in a close, evenly spaced row. Anal segment with sclerotic plate covering about three-fourths of segment; anal gills tapering and pointed, about as long as anal segment.

**FEMALE.**—Length of wing 4 mm. Beak and palps black, the beak with a small group of gray scales at apex; dorsum of head gray scaled. Mesonotum, fig. 116, with a broad mesal brown band extending from anterior margin to scutellum and divided down the meson by a very narrow line of gray scales; lateral bands of mesonotum and scutellar region gray; supplemental short brown bands are usually present on the posterior half of the lateral areas, these bands always short and separated from the mesal band by at least a definite line of gray scales. Dorsum of abdomen definitely banded, the apical two-thirds of most of the segments dark scaled, the basal third white scaled. Femora, fig. 125, mostly white scaled, the dorsal edge and apical portion of each black scaled; tibiae usually with upper and lower margins black scaled, sides predominantly pale scaled; tarsi predominantly black scaled, without banding, the posterior basitarsus with white scales often extending as irregular lines from base to near apex. Wings predominantly black scaled, the costal and subcostal areas frequently with many white scales mixed with the black ones.

**MALE.**—Size and general color as for female. Genitalia, fig. 148; basistyle with very large projecting apical lobe, which bears along its mesal edge a series of setae curved dorsad; basal lobe forming a triangular flap markedly detached from basistyle and connected with it chiefly by membranous folds, with a macrochaeta at extreme base, and with the apical portion curved and bearing fairly stout setae. Claspette slender, with a short apical filament that is expanded near base.

Holarctic in range, this species in North America is widely distributed from coast to coast. In much of the recent literature it has been called *hirsuteron* (Theobald) in the East and *aldrichi* Dyar & Knab in the West. Dr. Alan Stone writes me that he believes these two are the same species and should be considered under the name *sticticus*. Edwards (1932) has synonymized *aldrichi* with *lateralis* (Meigen). Dr. Stone writes that there is some doubt as to the identity of *lateralis* and believes it prudent to use *sticticus* for the species.

In Illinois *sticticus* is extremely common along the flood plains of the larger rivers, where it breeds in flood pools. At times individuals of the species appear in great swarms, and the females are ferocious biters

during the evening and also during the day in cloudy or shaded situations. Emergence of the adults occurs once a year, in early spring. The larvae seem to require shaded pools for development.

**Illinois Records.**—Larvae, collected April 3 to August 18, and many males and females, collected April 6 to October 25, are from Alto Pass, Belleville (USPHS), Billett, Bishop, Cache, Cahokia (USPHS), Cairo, Calvin, Camp Grant (USPHS), Carbondale, Carterville (USPHS), Casey, Caseyville, Charleston, Clinton, Crab Orchard Lake (USPHS), East St. Louis, Edwardsville, Fox Ridge State Park, Fulton, George Field (USPHS), Glencoe, Golconda, Gorham, Grafton (USPHS), Grand Tower, Granite City (USPHS), Grantsburg, Grayville (USPHS), Great Lakes Naval Training Station, Halfday, Havana, Herod, Homer, Hurst, Inman, Joetta, Johnston City (USPHS), Kankakee, Kappa, Karnak, Keensburg, Keithsburg, Lake Fork, La Rue, Lawrenceville (USPHS), Mascoutah, Matanzas Bay, Mokena, Mount Carmel, Mount Vernon, (USPHS), New Boston, New Haven, Oakwood, Palestine, Palisades, Patton, Pere Marquette State Park, Pike, Pingree Grove, Prophetstown, Pulaski, Ravinia, Reynoldsville, Ridge Lake, Rising Sun, Rockford, Russellville, St. Jacob, Savanna (USPHS), Scott Field (USPHS), Shawneetown, Springfield (USPHS), Starved Rock State Park, Tamaroa, Urbana, Utica, Ware, West Vincennes, Willow Springs, Wolf Lake, and Zion.

### 19. *Aedes spencerii* (Theobald)

**LARVA.**—Length 8 mm. Head wide, both upper and lower head hairs almost always single but occasionally one of them double. Terminal segments very similar to those of *vexans*, fig. 102. Air tube scarcely more than two and one-half times as long as wide; pecten with apical two or three teeth markedly detached; ventral tuft short and beyond pecten. Lateral comb consisting of about 10 to 12 scales arranged in a regular single or double row. Anal segment, fig. 110B, almost completely ringed by dorsal plate, with only a narrow, V-shaped area of membrane between the ventral edges of the plate, bearing one or two ventral hair tufts anterior to apical mesal barred areas; gills tapering, longer than segment.

**FEMALE.**—Length of wing 5 mm. Color of beak, head, mesonotum, and legs similar to color of corresponding parts of *sticticus*. Each segment of dorsum of abdomen, fig. 117, with a median stripe of white scales, an apical band of white scales, and a nar-

row basal band of white scales, the center of the lateral area being dark scaled. In very light specimens the dorsum of the abdomen may be almost entirely white scaled. Wings predominantly dark scaled but with many of the anterior veins mostly pale scaled, especially toward the base.

**MALE.**—Similar in general to the female but with the abdomen darker; in dark extremes the first four segments may be almost entirely dark scaled. Male genitalia, fig. 149, similar in general to those of *sticticus*, with the following differences: apical lobe of basistyle more diagonal and longer; apical filament of claspette with a small but pronounced notch at the base of the apical filament.

We have only a single Illinois record of this species, from Savanna, June 19, 1942, in light trap (USPHS). The species is reported to be widespread and abundant in the Great Plains region. The larvae have been taken in temporary rain pools and marshes in Minnesota (Owen 1937).

#### 20. *Aedes dupreei* (Coquillett)

**LARVA.**—Fig. 111. Head wide, with upper and lower hairs long, the upper hairs usually single, the lower ones double and situated almost directly anterior to upper ones; the species is unique in having the latero-dorsal hair of the frons branched. Eighth segment with a comb consisting of an even row of about six long teeth. Air tube only relatively long but narrow and tapering at apex, nearly four times as long as wide; hair tuft long, about six branched, situated before middle of siphon but beyond end of pecten; pecten consisting of an even row of few large teeth. Anal segment completely ringed by sclerotic shield; anal gills extremely long, over twice length of air tube, each gill containing a distinct trachea.

**FEMALE.**—Length of wing 2.5 mm. Beak and palps black, dorsum of head white scaled. Mesonotum with a wide silver stripe extending its entire length, the lateral area dark brown, abdomen entirely dark scaled. Legs almost entirely black scaled, except for the inner faces of the front and middle femora and all but the apexes of the hind femora. Wings entirely dark scaled.

**MALE.**—Size and color as for female. Male genitalia, fig. 147: basistyle with projecting and sharp apical lobe that bears only isolated short setae; basal lobe somewhat

ovate, detached from basistyle, connected with it chiefly by membranous folds and by a short sclerotized bridge on which arises the macrochaeta. Claspette slender, its apical filament curved and saber shaped.

We have only one record of the species from Illinois, a series of four females from Ware, August 14, 1942, Ross & Mohr. The specimens were collected as pupae from a temporary rain pool in the post oak flats along the Mississippi River. The species is predominantly southern and southeastern in distribution, and the Illinois record is the one farthest north.

#### 21. *Aedes fulvus pallens* E. S. Ross

**LARVA.**—Fig. 95. Head wide; upper head hairs long and single, lower ones long and double, situated as far anterior to the upper ones as half the distance between the upper hairs; between the lower hairs are a pair of very fine, branched hairs; preantennal hairs short and multiple. Thorax unique among the Illinois species in having the three lateral meso-thoracic tufts each 15 to 20 branched and relatively stout. Eighth segment with comb triangular, composed of about 30 small scales. Air tube short and tapering, stout, only twice as long as wide; ventral tuft large with about 14 filaments, situated ventrad of the pecten and considerably before its apex; pecten consisting of about 15 teeth, of which the 1 to 3 apical teeth are long, large, and well separated, the remainder small and forming a close row. Anal segment completely ringed with sclerotized dorsal shield; anal gills long and tapering, nearly twice as long as air tube.

**FEMALE.**—Length of wing 5.5 mm. Integument of almost entire body bright golden yellow except for a dark brown rectangle at each postero-lateral corner of the mesonotum, irregular dark brown areas at the ends of the abdominal tergites, and the almost black antennae. Body with conspicuous long slender hairs. Beak and palps yellow scaled, the extreme apex of both tipped with black scales. Mesonotum with scales of the ground color, very thin and scarcely wider than short setae. Abdomen with dorsum predominantly yellow scaled, the apex of each segment with a band of black scales. Legs yellow scaled, the knees and apical tarsal segments black scaled. Wings predominantly yellow scaled.

**MALE.**—Similar in size and color to female. Genitalia, fig. 143: basistyle with projecting and pointed apical lobe that continues basad to beyond the middle of the basistyle and ends in a low but definite shoulder; basal lobe completely detached from basistyle and joined to it by membranous folds, its macrochaeta appearing as a part of the basistyle proper rather than a part of the basal lobe; macrochaeta very long, flattened, widened at apex, and arising from a straplike internal thickening of the integument; basal lobe with slender setae. Claspette with base slender, its apical filament beyond the short neck abruptly enlarged to form a wide blade.

Our Illinois specimens belong to the subspecies *pallens*. It and its relatives have been treated in considerable detail by E. S. Ross (1943).

We have only two records for this species from Illinois, both from the southern quarter of the state (Ware and Mount Carmel). In addition, there is in the Chicago Natural History Museum a specimen from Hessville, Indiana, which is only a few miles from Chicago. This last specimen, which is a female, may have been carried to Hessville from Illinois or states farther south by rail or other transportation. The Mount Carmel specimen, a male collected in 1906, would seem to indicate that at least one colony existed in southern Illinois at that time. The Ware record consisted of four larvae collected August 14, 1942, Ross & Mohr, from a rain pool in the post oak flats; two of the larvae were reared, and males emerged. The species is primarily southeastern, and the Illinois records are apparently on the northwestern edge of its range.

The female from Hessville, Indiana, was recorded by Gerhard (1910) as *Aedes bimaculatus* (Coquillett), and the male from Mount Carmel, collected June 30, 1906, was recorded by Matheson (1930) as *Aedes cataphylla* Dyar.

## 22. *Aedes implacabilis* (Walker)

**LARVA.**—Fig. 106. Head relatively wide; upper and lower hairs very long, usually single, sometimes double, the lower hairs almost directly anterior to the upper hairs and without accessory hairs between them. Eighth segment with comb consisting of an arcuate row of five to seven teeth. Air tube

of moderate length, slightly more than three times as long as wide; lateral tuft very long and stout, usually with four filaments; pecten short, with about 15 teeth that usually form an even row in which the apical ones become slightly more separated. In some cases the apical one or two teeth may be definitely detached from the row. Anal segment completely circled by its sclerite; anal gills moderately long, tapering, and sharp.

**FEMALE.**—Length of wing 5 mm. Beak and palps black scaled. Dorsum of head and mesonotum tawny or golden scaled, the mesonotum frequently with a wide mesal band of reddish-brown scales. Abdomen with dorsum dark scaled, each segment with a basal band of white scales, the bands narrow at the base of the abdomen and becoming progressively larger toward apex. Legs with femora mostly pale scaled, tibiae pale with a mixture of dark scales, the tarsi predominantly dark scaled, without banding.

**MALE.**—Similar in size and color to female. Palps with a large apical brush. Genitalia, fig. 158: basistyle with a large ovate apical lobe, clothed with a cluster of fairly short setae, all pointing dorsad; basal lobe with ventral aspect forming a definite shelflike projection, the setae abundant and confined primarily to mesal aspect, macrochaeta single and moderately inconspicuous. Claspette with curved base, its filament narrow and angled, thickest at the angle.

Formerly known under the name *abserratus* Felt & Young, this species occurs in great numbers in a tamarack bog near Volo and in lesser numbers in neighboring bogs in the northeastern corner of the state. The larvae live in the sphagnum mat of shaded pools. In the bog at Volo such pools occur in the tamarack and poison sumac belt a few paces back from the open edge of the bog and contain no other mosquitoes except occasional colonies of *cinereus*.

Our Illinois records for *implacabilis* appear to be on the southern limit of the range of the species, which is northeastern in distribution. Only a single generation of adults emerges each year, in the late spring. The females are apparently crepuscular and do not bite to any considerable extent during daylight hours, even on days that are cloudy.

**Illinois Records.**—ANTIOCH: May 21, 1941, 2♂; April 23–30, 1942, 2♂, 1♀. VOLO: April 23, 1942, many larvae; April 26, 1942, 7♂, 2♀; May 3, 1942, 1♂; May 13, 1942, Ross,

Burks, & Mohr, 11 specimens, 1 ♀; May 16, 1942, many ♂ and ♀. WAUCONDA: emerged April 27, 1942, 1 ♂.

### 23. *Aedes punctor* (Kirby)

**LARVA.**—Head with the upper and lower hairs usually double. Eighth segment, air tube, and anal segment similar to those of *implacabilis*, differing chiefly in the comb. This has about 12 teeth forming a long irregular row (from Dyar).

**ADULTS.**—In size and general color indistinguishable from *implacabilis* adults. Male genitalia, fig. 156, differing in the following characters: apical lobe with longer and more abundant setae, which are curved dorsad; basal lobe much more massive, the sclerotized portion of the basistyle not extending out onto the lobe, the lobe curved and bearing abundant short setae over its entire surface and a very conspicuous macrochaeta at its basal corner; claspette with apical appendage short, curved, and narrowed at tip.

The only Illinois record of this species is a single male collected as a pupa in a tamarack bog pool at Volo; the adult emerged April 26, 1942. This specimen was collected in a large colony of *implacabilis*. Examination of hundreds of mosquito larvae and males from the locality failed to disclose a second specimen of *punctor*. The habits and distribution of *punctor* are almost identical with those of *implacabilis*.

## 10. *PSOROPHORA*

Robineau-Desvoidy

The females of this genus are fierce biters and the adults in many of the species are diurnal or nearly diurnal in habit. The life history of the genus is very similar to that of *Aedes*. The eggs are laid in damp ground cover and do not hatch until flooded. The larvae mature very rapidly. Larvae of two species are predaceous and feed on other mosquito larvae; larvae of other members of the genus are vegetarian and in the field are easily confused with those of *Aedes*. All species of the group breed intermittently throughout the summer. The larvae frequent temporary rain pools or flooded areas of many types. The adults of one or more species may appear in clouds soon after summer rains. All species hibernate in the egg stage.

The group is essentially southern. The range of the eight species known from Illinois does not extend far north of this state. Three other species of the genus occur within the territorial limits of the United States: *pygmaea* (Theobald) is recorded from southern Florida; *signipennis* (Coquillett) and *longipalpis* Roth occur in the central plains states and southwestward. The larvae are treated by Pratt (1946).

The species of this genus form three very distinct groups, which have been considered as subgenera. It is interesting to note that the female genitalia of all the Illinois species are practically identical.

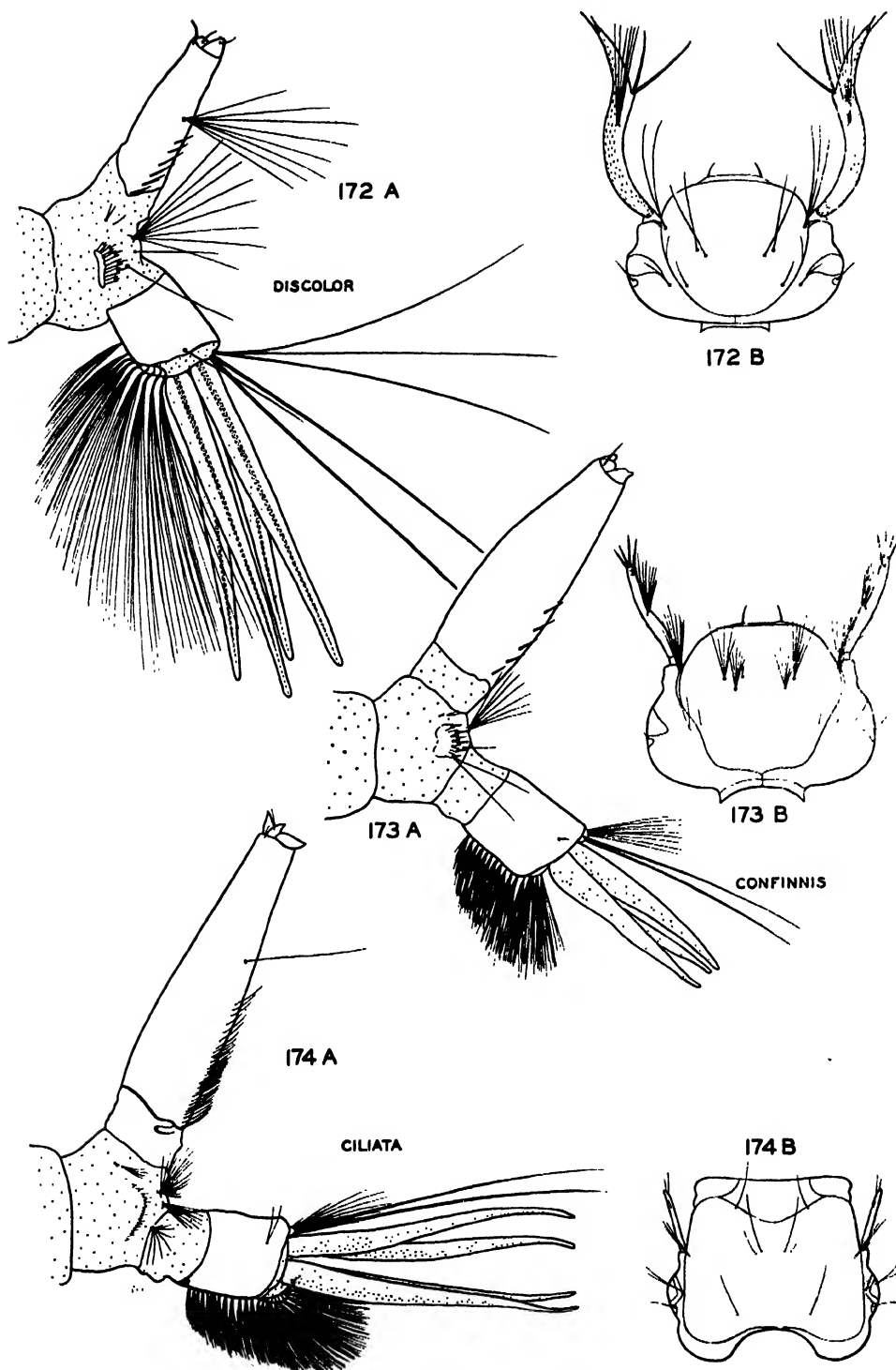
### KEY TO SPECIES

#### LARVAE

1. Head quadrate, antennae short, slender, and without definite tufts, fig. 174; large predaceous larvae. . . . . 2  
Head oval, antennae long, stout, and with definite tufts, fig. 173; small to fairly large, bottom feeders. . . . . 3
2. Lateral hair of anal segment with two to four branches, separating at base of hair. . . . . 1. *ciliata*  
Lateral hair of anal segment single, or forked some distance from base. . . . . 2. *howardii*
3. Antennae very large and inflated, air tube small, fig. 172. . . . . 8. *discolor*  
Antennae not inflated and air tube large and swollen, fig. 173. . . . . 4
4. Upper and lower head hairs multiple. . . . . 7. *confinnis*  
Upper head hairs single or double, lower head hairs single to triple. . . . . 5
5. Upper and lower head hairs single. . . . . 3. *cyanescens*  
Upper and lower head hairs double or triple. . . 4. *ferox*; 6. *varipes*; 5. *horrida*

#### FEMALES

1. Wing length over 6.5 mm., usually 7 to 8 mm.; mesonotum having a narrow mesal band of scales, flanked by a linear bare polished band on each side, fig. 26; hind femora each with a prominent tuft at apex, fig. 28. . . . . 2  
Wing length under 5 mm., usually 3.5 to 4.5 mm.; mesonotum with entire area scaled; hind femora sometimes bushy, fig. 30, but not with well-marked tufts. . . . . 3
2. Mesonotum with mesal band of scales yellow, hind tibiae and tarsi very bushy. . . . . 1. *ciliata*  
Mesonotum with mesal band of scales black, hind tibiae and tarsi pubescent but not unusually bushy. . . . . 2. *howardii*



Figs. 172-174.—*Psorophora* larvae: A, apex of abdomen, lateral aspect; B, dorsum of head. Mouth brushes are omitted from head drawings.



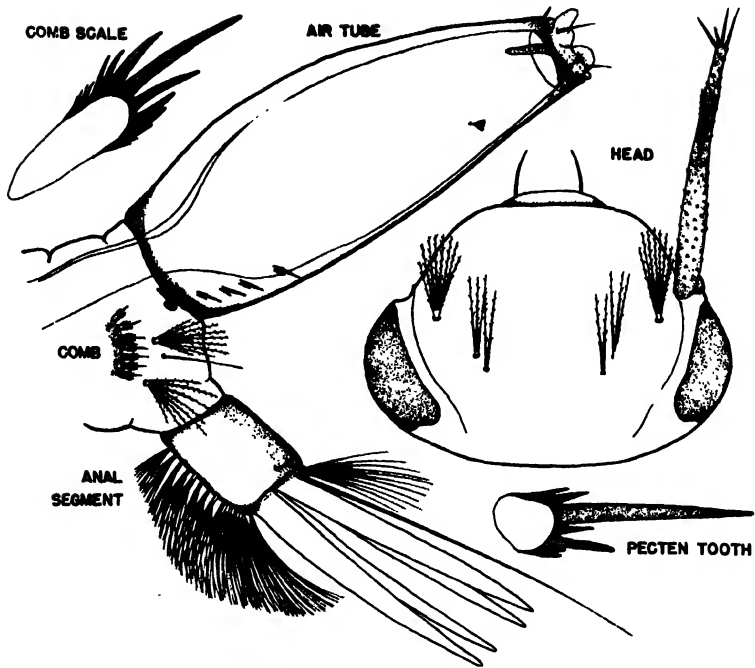


Fig. 175.—*Psorophora horrida*, larval parts. (After Roth.)

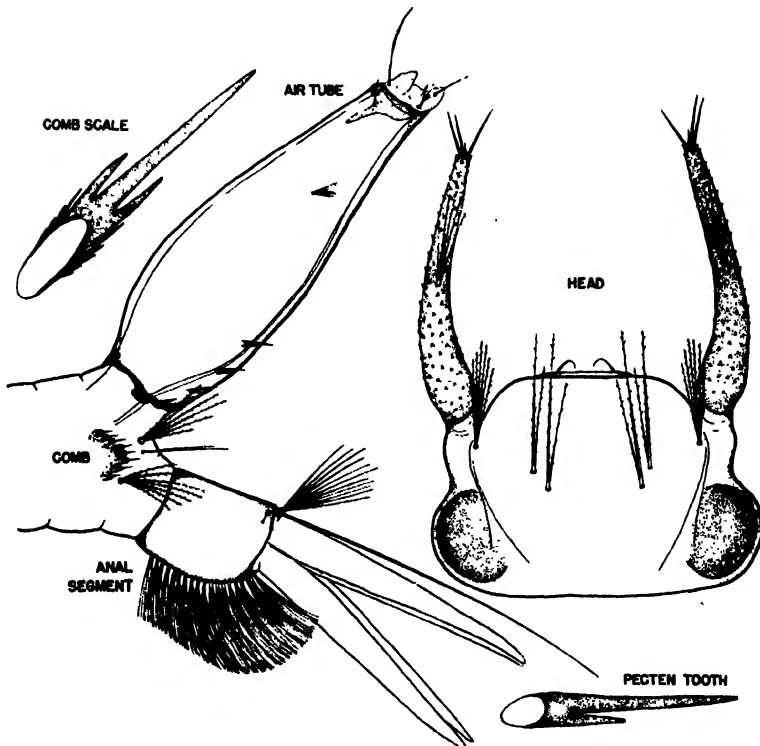


Fig. 176.—*Psorophora longipalpis*, larval parts. (After Roth.)

3. Hind tibiae and tarsi entirely purple; abdominal tergites purple, but with apical yellowish bands that are slightly broken on the meson... 3. *cyanescens*  
Hind tarsi either with all segments banded with white or with one or more segments all white, or dorsum of abdomen with only small lateral white spots, as in fig. 120.....4  
Each tarsal segment with apex dark and base with a white band, as in fig. 28... ..5

- Each tarsal segment entirely dark or entirely light; a leg may be banded but with an alternation of entirely dark and entirely light segments; rarely one segment may be banded.....6  
5. Wings mostly dark scaled but with a fairly even speckling of white scales; hind basitarsus nearly black, with two bright white bands, a narrow one at extreme base and a wider one at middle of segment.....7. *confinnis*

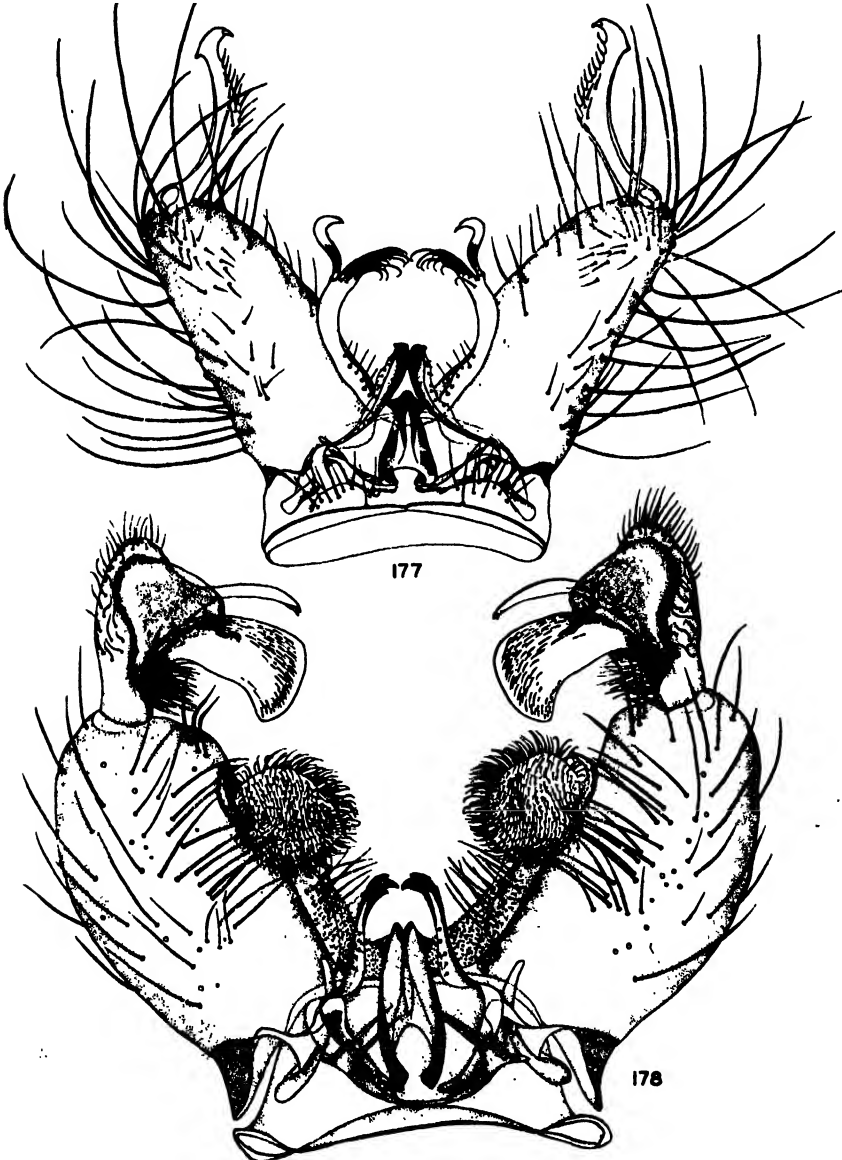


Fig. 177.—*Psorophora ciliata*, male genitalia. (After Matheson.)  
Fig. 178.—*Psorophora howardii*, male genitalia. (After Matheson.)

Wings with white scales grouped into definite lines or patches on some veins; hind basitarsus mostly white scaled but with dark scales intermingled uniformly along its entire length.....

- .....8. *discolor*  
 6. Mesonotum golden scaled over its entire area.....4. *ferox*  
 Mesonotum with mesal half black scaled, lateral fourths white scaled, forming longitudinal bands.....7  
 7. Hind tarsi having next to last segment white, the remainder black.....6. *varipes*

Hind tarsi having last two or two and one-half segments white, the remainder black.....5. *horrida*

#### MALES

1. Dististyle with a large mesal lobe and a long mesal spurlike projection, fig. 178  
 .....2. *howardii*  
 Dististyle without mesal processes.....2  
 2. Dististyle with tip truncate and apical spur situated before apex, fig. 180.....  
 .....6. *varipes*  
 Dististyle with tip tapered and small, apical spur situated at end, fig. 179...3

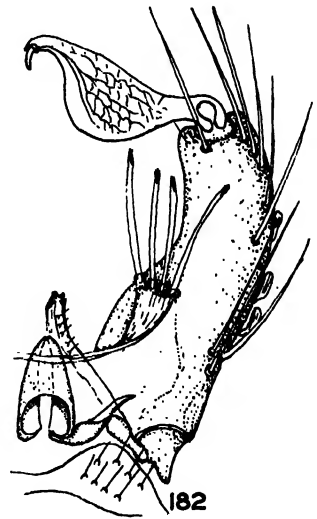
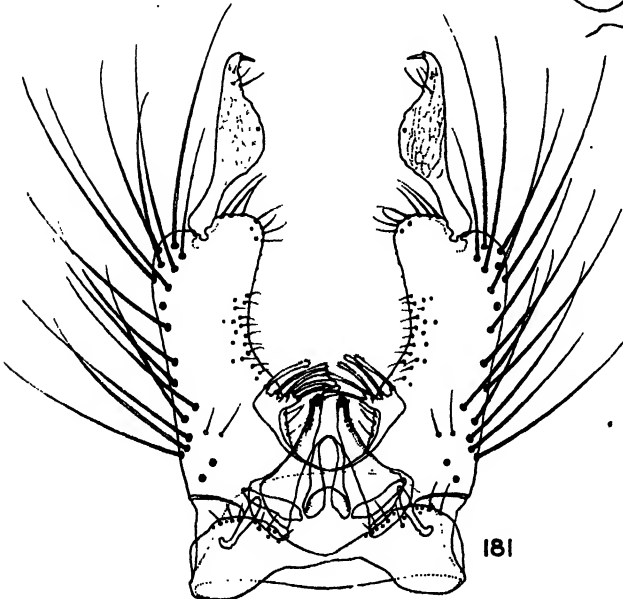
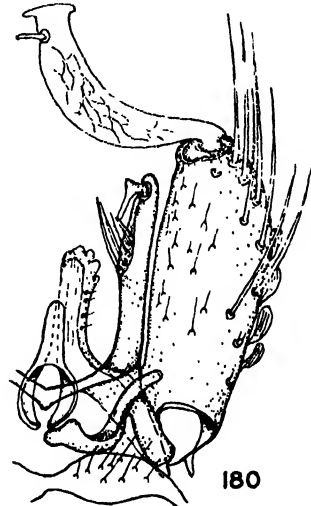
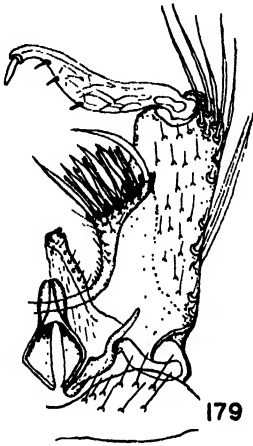


Fig. 179.—*Psorophora cyanescens*, male genitalia. (After Matheson.)

Fig. 180.—*Psorophora varipes*, male genitalia. (After Matheson.)

Fig. 181.—*Psorophora confinis*, male genitalia. (After Matheson.)

Fig. 182.—*Psorophora discolor*, male genitalia. (After Matheson.)

3. Dististyle narrow and sinuate, with a mesal row of bristles and a sharp sub-apical ventral tooth, fig. 177...1. *ciliata*  
Dististyle expanded near middle, without mesal row of bristles and without ventral tooth, fig. 181.....4
4. Apex of claspettes with a series of simple setae and two flattened contorted leaflets at lateral corner, fig. 183:1.....  
.....4. *ferox*; 5. *horrida*  
Apex of claspettes without contorted leaflets, at most with scales and thickened hairs, figs. 179, 182.....5
5. Apex of claspettes with a dense series of hairs and scales, fig. 179...3. *cyanescens*  
Apex of claspettes with a series of only four to eight long, thickened hairs, fig. 181.....6
6. Apex of claspettes with four or five thickened hairs, fig. 182.....8. *discolor*  
Apex of claspettes with five to eight thickened hairs, fig. 181.....7. *confinnis*

SYNOPSIS OF SUBGENERA REPRESENTED  
IN ILLINOIS

1. Adults with mesonotum having a pair of longitudinal, pale shining areas on each side of a narrow mesal band of scales; large species, gallinippers. Larvae predaceous, having quadrangular heads and small antennae without tufts, fig. 174...  
.....*Psorophora*  
Adults with mesonotum having a uniform covering of scales; small to moderate size species. Larvae vegetarian, with ovate heads and long, tuft-bearing antennae, fig. 173.....2
2. Palps of male not upturned at end; tarsal claws of female with large subapical

teeth; tibiae and tarsi purple except for a few segments of hind tarsi, which may be white.....*Janthinosoma*  
Palps of male upturned; claws of female without subapical teeth; tibiae with numerous white scales, tarsi having each segment banded with white at base, dark at apex.....*Grabhamia*

Subgenus *Psorophora*  
Robineau-Desvoidy

This subgenus includes two species, *ciliata* and *howardii*.

1. *Psorophora ciliata* (Fabricius)

LARVA.—Fig. 174. Head quadrate, with short slender antennae and only a few inconspicuous hairs. Eighth segment with the comb consisting of an arc of scales arranged along the edge of a slightly sclerotized crescent. Air tube long and moderately robust, tapering to apex, with pecten consisting of scales that are sclerotized at base and hair-like at apex. Anal gills very long.

FEMALE.—Length of wing 7 to 8 mm. Body integument yellowish brown, with the central part of the mesonotum dark brown to almost black; pubescence of many areas not sufficiently dense to obscure the integumental color. Beak and palps with erect, shaggy, dark or tawny scales, dorsum of head covered with white scales. Mesonotum, fig. 26, with a narrow center stripe of white scales, flanked on each side with a pol-

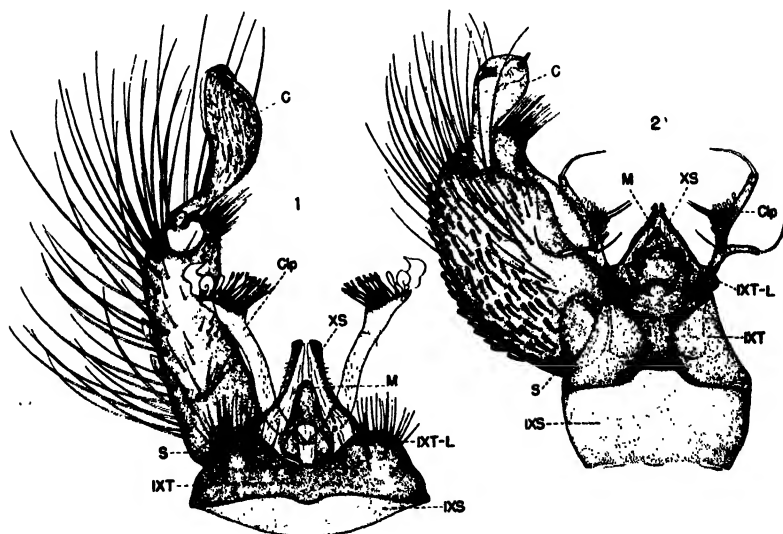


Fig. 183.—*Psorophora*, male genitalia. 1, *P. horrida*; 2, *P. longipalpis*. (After Roth.)

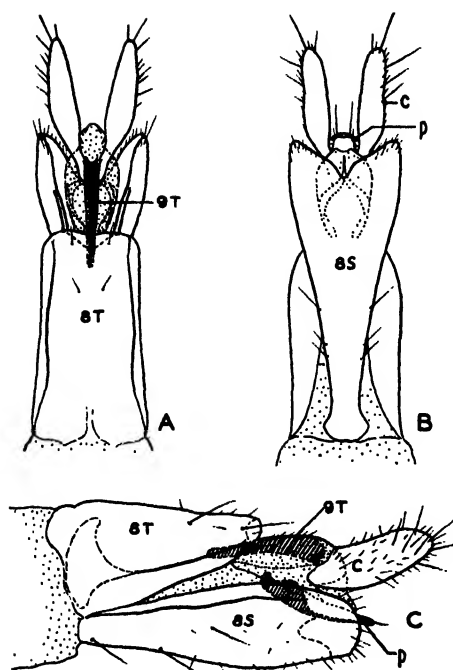


Fig. 184.—*Psorophora ciliata*, female genitalia. A, dorsal aspect; B, ventral aspect; C, lateral aspect. Abbreviations: c, cercus; p, postgenital plate; s, sternite; t, tergite.

ished pale stripe. Laterad of this is a narrow stripe of hairs and black scales and laterad of this is a large area clothed with white scales. Abdomen chiefly tawny or white scaled. Apical fifth of femora and all hind tibiae and tarsi very shaggy, with erect black scales; extreme base of each hind tibia and basal fourth or fifth of each tarsal segment with a band of appressed white scales. Front and middle tibiae and tarsi yellow, not shaggy. Wings dark scaled and usually inconspicuous.

**MALE.**—Similar in size, color, and general structure to female. Palps very long, much longer than beak, the apical three segments with a very large, extensive shaggy brush. Male genitalia, fig. 177: dististyle sinuate and narrow, bearing a mesal brush of bristles and a dorsal triangular projection near apex; claspettes long, free from basistyle, the apex of each with a row of thickened hairs and with a flattened sinuate leaflet on lateral corner.

This species is of unusual interest because it is one of the few whose larvae are predaceous on other mosquito larvae. The big

*ciliata* larvae, which breed in rain pools, usually with large numbers of *Aedes vexans* and with other species of *Psorophora*, move about among the other larvae and cause no commotion. When hungry, a *ciliata* larva simply makes a grab with its mouthparts and mouthbrushes for one of the smaller larvae (it seldom misses) and gradually maneuvers it so that, with the head or tail in its mouth, it can swallow its victim whole. In actions and habits in securing prey, *ciliata* larvae are almost the exact counterparts of the gars among the fish. Usually a full grown *ciliata* larva will consume three or four other larvae per day. In spite of their large size, *ciliata* larvae mature as rapidly as the smaller species.

The *ciliata* females are vicious biters. After a blood meal, they are almost a terrifying sight, due to their large size and business-like appearance. They attack on cloudy days as well as during the evenings. The larvae, which breed in a wide variety of rain pools, are not frequently encountered, but in this state are generally associated with *Aedes vexans*.

Widely distributed from Central America through the central and eastern states to southeastern Canada, the species occurs generally over Illinois. It was recorded from Chicago by Gerhard (1910) and from Urbana by Matheson (1930).

**Illinois Records.**—Larvae, collected May 25 to September 8, and many males and females, collected May 29 to October 21, are from Algonquin, Beach, Beardstown, Bement, Bishop, Bridgewater, Cahokia (USPHS), Camp Grant (USPHS), Carbondale (USPHS), Carterville (USPHS), Cave-in-Rock, Champaign, Chebanse, Chicago, Crab Orchard Lake (USPHS), Downs, East St. Louis, Fountain Bluff, Gorham, Grafton (USPHS), Grand Tower, Granite City (USPHS), Great Lakes Naval Training Station, Havana, Homer Park, Marion (USPHS), New Holland, Newton, Oregon, Pingree Grove, Rockford, Savanna (USPHS), Scott Field (USPHS), Thompson's Lake, Urbana, Ware, West Vienna, and Zion.

## 2. *Psorophora howardii* Coquillett

**LARVA.**—Almost identical with that of *ciliata*. The only reliable difference found to date is the single or split condition of the lateral hair of the anal segment (this hair is branched from base in *ciliata*).

**FEMALE.**—Similar to *ciliata* female in size, general color, and characteristics. It differs

chiefly in having the mesal stripe of the mesonotum composed of black scales, and in having the hind tibiae and tarsi yellow and only moderately spiny; identical to *ciliata* female in appearance of the front and middle legs.

**MALE.**—Similar to female in size and color. Palps very long, the apical brush represented by short scattered hairs. Genitalia, fig. 178, of striking appearance; claspette ending in an ovate hairy lobe; dististyle with a large, long flaplike mesal projection, the inner apical corner prolonged into a long slender beak.

This species has a wide distribution that embraces the Neotropical region and most of the southern part of the United States. It has been taken several times in southern Illinois and occasionally in central Illinois. The records for this state apparently represent the northern limit of the species range. The larvae have been reared from pools in woodlands and from pools in ruts through a pasture. In the latter case they occurred together with *Psorophora ciliata* and *Aedes vexans*. In southern Illinois they were taken, in company with *vexans* and *P. ferox*, in woodland pools in the post oak flats of the Mississippi River valley. The species has never been found abundantly in the state.

**Illinois Records.**—Larvae, collected June 9 to August 14, and adults, collected May 26 to September 16, are from Cahokia (USPHS), Carterville (USPHS), Chanute Field (USPHS), Crab Orchard Lake (USPHS), Goreville, Gorham, Grand Tower, New Athens, Scott Field (USPHS), Springfield, and Ware.

#### Subgenus *Janthinosoma* Arribáizaga

The species of this subgenus are conspicuous by the purple iridescent areas on the abdomen and legs, and the purplish cast on many parts of the body, such as the palps and wing scales.

Females of all the species in the subgenus are vicious biters.

### 3. *Psorophora cyanescens* (Coquillett)

**LARVA.**—(From Matheson 1944.) Head oval, upper and lower head hairs single and long, antennae stout and cylindrical, each with two- or three-haired tuft near middle. Eighth segment with lateral comb consisting of three or four stout scales on a small

sclerotized area. Air tube swollen, about three times as long as wide; pecten with three or four teeth. Anal gills slender, very long and pointed.

**FEMALE.**—Length of wing 4.5 mm. Beak and palps black or purplish. Integument of head and thorax dull black. Dorsum of head and entire mesonotum covered with whitish scales. Dorsum of abdomen with segments purple scaled except for an apical band of white scales, the band of the apical segments interrupted on the meson. Legs with femora almost entirely yellow; extreme apexes of femora and all the tibiae and tarsi purple; extreme tips of femora each with a small whitish knee spot. Legs purple scaled, the scales inconspicuous.

**MALE.**—Genitalia as in fig. 179: dististyle sinuate, expanded at middle; claspettes free from basistyle only near apex; apical margin of claspettes with a dense row of hair and scales and with a long curved spine on the lateral corner.

Adults of this species have been taken in numbers in southern Illinois but to date we have found no larvae. The adults are very unusual in many of their habits. They attack during the day and seem to prefer bright sunlight. Extremely rapid fliers, they make a high-pitched sound somewhat resembling that of a humming bird. They are wary and circle a prospective victim before alighting. We found it necessary to let them get a good start at biting before we could bottle them with certainty. On one occasion Dr. Carl O. Mohr and I encountered a flight of adults at West Vienna. When we stepped into the bright sun, the *cyanescens* females attacked quite readily. When we retired into nearby shade, we were not molested. We repeated this action several times and always with the same results. A single female of this species makes so much noise that it can be heard approaching for several yards.

As in other members of the genus, the larvae are reported to breed in rain pools of various types.

Like *howardii*, this species extends its range from the Neotropical region into the southern and central states. It has been recorded from states as far north as Oklahoma, Kansas, and Illinois.

**Illinois Records.**—Adults, collected May 21 to September 15, are from Carterville (USPHS), Crab Orchard Lake (USPHS), East St. Louis, French Village (USPHS), Granite City (USPHS),

Marion (USPHS), New Holland, Savanna (USPHS), Scott Field (USPHS), Ware, and West Vienna.

#### 4. *Psorophora ferox* (Humboldt)

**LARVA.**—Head ovate, antennae elongate, with a multiple tuft near middle, upper and lower head hairs double. Eighth segment with a comb of six or seven scales arranged along the edge of an indistinct sclerite. Air tube stout, expanded, about three times as long as wide; pecten of three or four stout teeth.

**FEMALE.**—Length of wing 4.5 to 5.0 mm. Integument of head yellowish brown, mesonotum almost black. Beak and palps covered with purplish scales. Dorsum of head and pronotum with a uniform but not close covering of whitish or yellowish scales. Dorsum of abdomen purple with lateral white spots visible on segments 4 to 7. Legs with femora yellow, the apical and upper areas purple; tibiae and tarsi purple except for the last two or two and one-half segments of the hind tarsi, which are white; tip of femora with small white knee spots. Wings purplish-brown scaled.

**MALE.**—Similar to female in size and color. Palps elongate, with only a sparse brush at apex. Male genitalia with dististyle considerably expanded and leaflike, claspettes with a long base, entirely free from basistyle, and with their apexes ornamented with a row of setae and each having two or three contorted leaflets on lateral corner; very similar to genitalia of *horrida* (fig. 183:1). To date, no very satisfactory characters have been found to separate the two species on genitalia. The color markings given in the key to females are much more trustworthy.

Common in many parts of Illinois, this species is frequently a real pest. The females are fierce biters and attack readily during the day in shady situations. The larvae breed most abundantly in flood pools, and in stream or river valleys. The first generation of adults emerges early in the season, usually about the middle of May or shortly afterward, and successive generations are on the wing through the summer and well into September.

This species has a wide range from south-eastern Canada through the eastern United States into the Neotropical region. In Illi-

nois the species is encountered in much greater abundance in the southern half of the state than northward.

**Illinois Records.**—Larvae were collected at Karnak, April 29, 1941. Many males and females, collected May 13 to October 14, are from Benson, Cahokia (USPHS), Carbondale (USPHS), Carterville (USPHS), Champaign, Crab Orchard Lake (USPHS), East St. Louis, Elsah, Fort Chartres State Park, Glencoe, Gorham, Gossett, Grand Tower, Grantsburg, Grayville, Havana, Herod, Homer, Karnak, La Rue, Lawrenceville (USPHS), Mascoutah, Momence, Oakwood, Patton, Quincy, St. Jacob, Scott Field (USPHS), Springfield, Urbana, Utica, Vienna, Ware, West Vienna, White Heath, and Wolf Lake.

#### 5. *Psorophora horrida* (Dyar & Knab)

**LARVA.**—Fig. 175. Very similar to the larvae of *ferox* and *varipes*. To date, reliable and tested characters have not been found to insure correct identification of the larvae of this group of species.

**FEMALE.**—Length of wing 4.5 mm. Head and thorax nearly black. Palps and beak purple scaled. Dorsum of head white scaled. Mesonotum with mesal third black scaled, lateral third white scaled, these areas forming definite longitudinal bands. Dorsum of abdomen purple scaled with small white patches on some or all of the segments. Femora with basal portions mostly yellow; the apical and dorsal areas are black, and the extreme tip (knee) is white; tibiae and tarsi purple with the exception of the last two segments of the hind tarsi, which are white. Wings purple scaled.

**MALE.**—Similar in size, color, and general structure to female. Genitalia, fig. 183:1, with dististyle swollen and leaflike; claspettes each with a long stalk, which is free from basistyle, and with apex bearing a row of setae and two contorted leaflets at the lateral corner.

A species of very similar coloration, *longipalpis* Roth (1945a), is distinguished in lacking the white knee spot and also in details of the male genitalia, fig. 183:2. The larva of *longipalpis* differs from that of *horrida* chiefly in details of the chaetotaxy, fig. 176. A species that occurs along the eastern portion of the great plains, *longipalpis* may eventually be found in Illinois.

Very similar in habits and distribution to *ferox*, *horrida* breeds in immense numbers in bottomland pools. It has been taken

abundantly in the southern half of the state and less abundantly in the northern half. The females are vicious biters that attack readily in the daytime.

**Illinois Records.**—Adults, collected May 4 to September 24, are from Camp Grant (USPHS), East St. Louis, Elizabethtown, Fort Chartres State Park, Grantsburg, Havana, Joetta, Kappa, Karnak, La Rue, Mascoutah, Momence, Mounds, Mount Vernon (USPHS), Oak Park, Patton, Pere Marquette State Park, Quincy, Rockford, St. Jacob, Savanna, Scott Field (USPHS), Seymour, Starved Rock State Park, Urbana, Utica, Warsaw, Wedron, White Heath, White Pines Forest State Park, and Whitesville.

#### 6. *Psorophora varipes* (Coquillett)

**LARVA.**—Practically identical with the larvae of *ferox* and *horrida*. To date satisfactory characters have not been found to identify these forms.

**FEMALE.**—Length of wing 4.5 mm. Integument of head and thorax black. Beak and palps purple scaled. Dorsum of head white scaled. Mesonotum with mesal half black scaled, lateral fourth white scaled and forming a conspicuous stripe. Abdomen purple with lateral white spots as in *ferox*. Legs with base of femora yellow, apical and dorsal portions purple; tibiae and tarsi entirely purple with the exception of the fourth tarsal segment of the hind tarsi, which is white; apex of femora each with a conspicuous knee spot.

**MALE.**—Size, color, and general structure as for female. Male genitalia, fig. 180, with dististyle expanded, broad to apex, apical spine situated just before the tip; claspettes long, free from basistyle, the apex with a row of spines and a foot-shaped leaflet on lateral corner.

This southern species has been taken only in the southern third of Illinois. At times it is abundant in the cypress bottoms, and the larvae probably breed in the summer rain pools of this area. It is a vicious biter and is on the wing as early as the middle of May. No larvae have been taken in our recent survey; habits of the larvae are recorded as being similar to those of other species in the genus.

**Illinois Records.**—Adults, collected April 30 to August 15, are from Cache, Duck Pond Hill, Grand Tower, Grantsburg, Karnak, La Rue, Lawrenceville (USPHS), Patton, Scott Field (USPHS), and Ware.

#### Subgenus *Grabhamia* Theobald

The members of this group are non-metallic in color and drab in appearance. The scales of the occiput and mesonotum are usually small and well separated. Another characteristic of the subgenus is the mixture of white scales and dark scales on the wing; in some species this mixture develops into a definite pattern.

#### 7. *Psorophora confinnis* (Arribáizaga)

**LARVA.**—Fig. 173. Head ovate, wider than long, with long antennae having a multiple tuft near middle; upper and lower head hairs multiple, usually with five or six branches. Eighth segment with comb consisting of about six scales arranged in a crescent. Air tube slightly swollen near middle, tapering near apex; pecten consisting of about four teeth. Anal gills of moderate length, pointed.

**FEMALE.**—Length of wing 4.5 mm. Palps dark-brown scaled with tip white scaled; beak with central half tawny scaled, base brown scaled and apex black scaled. Integument of head and thorax sooty dark brown, nearly black. Dorsum of head tawny scaled. Mesonotum with a mixture of brown and white scales. Dorsum of abdomen dark-brown scaled with apical patches of white scales; on segments 2 and 3, these form a continuous band across the segment and on the segments beyond that they form a pair of lateral areas usually fairly well separated on the meson. Femora predominantly dark-brown scaled and having irregular white scales scattered throughout, with a definite band of white scales just before the apex, fig. 31, and with a prominent small knee spot at apex; tibiae dark-brown scaled with patches of white scales that make a series of dots running down the full length of the segment; tarsi of all legs nearly black, the basitarsus with a very narrow white ring at base and a definite tawny ring at middle, the remaining segments with the basal third or half white. Wings with a fairly even mixture of white scales and dark scales distributed so that no spots or bands result.

**MALE.**—Similar in size, color, and general structure to female. Palps long, the apical two segments and part of the preceding with a long, extensive, and conspicuous brush. Male genitalia, fig. 181: dististyle



expanded and leaflike in middle; claspettes each with short stem and solidly fused to the basistyle; apices of claspettes each with a row of five to eight thickened hairs.

The larvae of this species breed in temporary rain pools of pastures, farm yards, and other more or less open situations. The females bite fiercely.

Breeding in immense numbers, this species is a scourge in the flooded rice fields of Arkansas and other southern states. In Illinois it is common only in the southern part of the state. It has been taken in small numbers as far north as Chicago. Until recently the name *columbiae* was generally used for this species, and under this name it was recorded in Illinois by Matheson (1930). The species is widely distributed from about the latitude of central Illinois south into the Neotropical region.

**Illinois Records.**—Larvae, collected May 26 to September 16, and many males and females, collected May 27 to October 11, are from Beardstown, Belleville (USPHS), Benson, Cahokia (USPHS), Cairo (USPHS), Carbondale (USPHS), Carterville (USPHS), Champaign, Crab Orchard Lake (USPHS), East St. Louis, Elizabethtown, French Village (USPHS), Grafton (USPHS), Granite City (USPHS), Grand Tower, Havana, Johnston City (USPHS), Marion (USPHS), Mount Vernon (USPHS), Oak Park, Sandoval, Scott Field (USPHS), Springfield, Vienna, Ware, and West Vienna.

### 8. *Psorophora discolor* (Coquillett)

**LARVA.**—Fig. 172. Head broad; antennae very long, thickened, with a multiple dorsal tuft near middle and with two stout spines on venter about two-thirds distance from base; preantennal tuft double and long; upper and lower head hairs single. Eighth segment with a crescentic comb of six scales united by a small sclerotized area. Air tube very short, about as long as width of seventh segment, the tube itself about three times as long as wide, with a pecten of about four or five long scales and with a multiple ventral tuft that is as long as the tube. Anal gills very long, with a trachea extending the full length of each.

**FEMALE.**—Length of wing 3.5 mm. Integument of head and thorax dull, dark gray-brown. Beak with middle half pale scaled, base and apex brown; palps brown with a few white scales at tip. Head with a scattering of brown scales and narrow sil-

very scales. Mesonotum with a mixture of brown scales and silvery gray scales, all of which are small and well separated, giving a stippled effect. Dorsum of abdomen predominantly white scaled, with an irregular mixture of brown scales, the scales normal in size and overlapping. Femora with a mixture of white and brown scales, with a definite preapical band of white scales, and a white knee spot, the area between the preapical band and the knee spot predominantly brown; tibiae chiefly white scaled, with an intermingling of brown scales, especially toward tips; basitarsus white scaled with brown scales predominant toward tip; remaining tarsal segments with basal half white scaled, apex brown to black. Wings predominantly white scaled, with an intermingling of brown scales that form a long irregular blotch near the middle of Costa and many short lines scattered throughout the rest of the wing, giving it an irregular mottled appearance.

**MALE.**—Similar in size, color, and general structure to female. Palps very long, with an extensive conspicuous brush. Male genitalia, fig. 182, almost exactly as in *confinnis* but usually with only four setae at the apex of each claspette.

Adults of *discolor* have frequently been confused with those of *signipennis* (Coquillett), a more western species. The *signipennis* adults may be distinguished by the barlike costal markings in the wings, which are as definite as those in fig. 66.

Occurring through most of the South, this species has been taken westward to Oklahoma and Texas. In Illinois it has been taken chiefly in the southern fourth of the state. It is recorded as biting man, but in Illinois it is not numerous enough to be a pest. The larvae breed in rain pools. The largest colony of larvae we encountered in our Illinois survey was in a weed-choked roadside ditch. The general area was cleared and open, but the ditch was overgrown and heavily shaded with weeds. The larvae were wary and sparse, and some patience was required to gather a series, one larva at a time.

**Illinois Records.**—Larvae, collected June 8 to August 3, and adults, collected May 29 to September 27, are from Cahokia (USPHS), Carterville (USPHS), Crab Orchard Lake (USPHS), East St. Louis, Fort Massac State Park, Grafton (USPHS), Granite City (USPHS), Herrin (USPHS), Marion, Mount Carmel, Mount Vernon, Scott Field, Seneca (USPHS), and Ware.

# LITERATURE CITED

- Aitken, Thomas H. G.  
1945. Studies on the anopheline complex of western America. Calif. Univ. Pubs. Ent. 7(11):273-636. 39 figs.
- Bradley, G. H., and W. V. King  
1941. Bionomics and ecology of Nearctic *Anopheles*. Am. Assn. Adv. Sci. Pub. 15:79-87.
- Carpenter, Stanley J.  
1941. The mosquitoes of Arkansas. Arkansas Board of Health, Little Rock, Ark. 87 pp., 15 pls.
- Carpenter, Stanley J., Woodrow W. Middlekauff, and Roy W. Chamberlain  
1946. The mosquitoes of the southern United States east of Oklahoma and Texas. Am. Midland Nat. Monograph 3. 292 pp., 155 figs.
- Chandler, S. C.  
1920. A study of the malarial mosquitoes of southern Illinois. I. Operations of 1918 and 1919. Ill. Nat. Hist. Surv. Bul. 14(12):307-28. 17 figs. II. Operations of 1920. Ill. Nat. Hist. Surv. Bul. 15(3):23-32. 2 figs.
- Daggy, Richard R., Oswald J. Muegge, and William A. Riley  
1941. A preliminary survey of the anopheline mosquito fauna of southeastern Minnesota and adjacent Wisconsin areas. Pub. Health Reps. 56(17):883-95.
- Dickinson, W. E.  
1944. The mosquitoes of Wisconsin. Milwaukee Pub. Mus. Bul. 8(3):269-365, figs. 198-230.
- Dyar, Harrison G.  
1928. The mosquitoes of the Americas. Carnegie Inst. Wash. Pub. 387. 616 pp., 123 pls.
- Edwards, F. W.  
1932. Diptera, Fam. Culicidae, in P. Wytsman, Genera insectorum, fasc. 194. Bruxelles: V. Verteneuil and L. Desmet. 258 pp., illus.
- Gerhard, W. J.  
1910. A list of the mosquitoes in the vicinity of Chicago, Illinois. Ent. News 21:293-300.
- Gjullin, C. M.  
1937. The female genitalia of *Aedes* mosquitoes of the Pacific Coast states. Ent. Soc. Wash. Proc. 39(9):252-66. 20 figs.
- Horsfall, W. R.  
1940. Biology of Thibault's mosquito. Ark. Ag. Exp. Sta. Ann. Rep. 51:66.
- Jenkins, Dale W., and Stanley J. Carpenter  
1946. Ecology of the tree hole breeding mosquitoes of Nearctic North America. Ecol. Mono. 16(1):31-48. 5 figs.
- King, W. V., and G. H. Bradley  
1937. Notes on *Culex erraticus* and related species in the United States. Ent. Soc. Am. Ann. 30(2):345-57. 1 pl., 1 fig.  
1941. General morphology of *Anopheles* and classification of the Nearctic species. Distribution of the Nearctic species of *Anopheles*. Am. Assn. Adv. Sci. Pub. 15:63-78. 6 figs., 1 pl.
- King, W. V., G. H. Bradley, and T. E. McNeel  
1939. The mosquitoes of the southeastern states. U. S. Dept. Ag. Misc. Pub. 336. 91 pp., 26 figs.
- Matheson, Robert  
1930. Distribution notes on Culicidae. Brooklyn Ent. Soc. Bul. 25(5):291-4.  
1944. Handbook of the mosquitoes of North America. The Comstock Publishing Co., Ithaca, N. Y. 314 pp., 33 pls.
- Owen, William B.  
1937. The mosquitoes of Minnesota, with special reference to their biologies. Minn. Univ. Bul. 126. 75 pp., 11 figs.

**Pratt, Harry D.**

1945. *Mansonia indubitans* Dyar and Shannon—a new mosquito addition to the United States fauna. Kans. Ent. Soc. Jour. 18(4):121-9. 14 figs.  
1946. The larva of *Psorophora (Janthinosoma) coffini* Dyar and Knab and a key to the *Psorophora* larvae of the United States and the Greater Antilles (Diptera, Culicidae). Ent. Soc. Wash. 48(8):209-14. 1 fig.

**Pratt, Harry D., W. W. Wirth, and D. G. Denning**

1945. The occurrence of *Culex opisthopus* Komp in Puerto Rico and Florida, with a description of the larva. Ent. Soc. Wash. Proc. 47(8):245-9. 2 pls.

**Ross, Edward S.**

1943. The identity of *Aedes bimaculatus* (Coq.) and a new subspecies of *Aedes fulvus* (Wied.) from the United States. Ent. Soc. Wash. Proc. 45(6):143-51. 4 figs.

**Ross, Edward S., and H. Radclyffe Roberts**

1943. Mosquito Atlas, Part I. American Entomological Society and the Academy of Natural Sciences of Philadelphia. iv + 44 pp.

**Roth, Louis M.**

1943. A key to the *Culex* (Diptera, Culicidae) of the southeastern United States, by male terminalia. Kans. Ent. Soc. Jour. 16(4):117-33.  
1944. A key to the *Anopheles* of the southeastern United States, by male genitalia (Diptera, Culicidae). Am. Midland Nat. 31(1):96-110.  
1945a. The male and larva of *Psorophora horrida* (Dyar & Knab) and a new species of *Psorophora* from the United States. Ent. Soc. Wash. Proc. 47(1):1-23. 19 figs.  
1945b. Aberrations and variations in anopheline larvae of the southeastern United States. Ent. Soc. Wash. Proc. 47(9):257-78. 66 figs.  
1946. The female genitalia of the *Wyeomyia* of North America (Diptera: Culicidae). Ent. Soc. Am. Ann. 39(2):292-7. 1 pl.

**Rozeboom, L. E.**

1942. The mosquitoes of Oklahoma. Okla. Ag. Exp. Sta. Tech. Bul. T-16. 56 pp., illus.

**Texas State Health Department**

1944. The mosquitoes of Texas. Compiled by the Division of Medical Entomology, Bureau of Laboratories, Austin, Texas. 100 pp., 32 figs.

**Wirth, Willis W.**

1945. The occurrence of *Culex (Melanoconion) elevator* Dyar & Knab in Florida, with keys to the melanoconions of the United States. Ent. Soc. Wash. Proc. 47(7):199-210. 30 figs.

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DEPARTMENT OF REGISTRATION AND EDUCATION  
FRANK G. THOMPSON, *Director*

NATURAL HISTORY SURVEY DIVISION  
HARLOW B. MILLS, *Chief*

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Volume 24

BULLETIN

Article 2

# The Leafhoppers, or Cicadellidae, of Illinois (Eurymelinae—Balcluthinae)

D. M. DELONG



*Printed by Authority of the State of Illinois*

URBANA, ILLINOIS

*June 1948*

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*This paper is a contribution from the Section of Faunistic Surveys and Insect Identification.*

(39130—2M—6-47)

## FOREWORD

IN 1934 a project was organized to investigate the Cicadellidae, or leafhoppers, of Illinois and to prepare a comprehensive report on the fauna of the state. Dr. D. M. DeLong, Ohio State University, Columbus, Ohio, very kindly accepted the post as project leader to direct the field work, identify the material, and write the final report. Accordingly, Dr. DeLong was employed by the Illinois Natural History Survey as Assistant Entomologist during the summers of 1934, 1935, 1936, and 1938, and as Research Entomologist for shorter periods in 1941 and 1945.

In general pattern, the field program for the leafhopper study followed that for the Natural History Survey's study of other groups, such as the Miridae. From 1934 through 1936 collecting trips, to various parts of the state, were planned to include as many diverse ecological types as possible. Areas of natural vegetation provided the most extensive faunal possibilities. Many of these exist throughout Illinois in the state parks and forests, in national forests, along railroad rights-of-way, and in small scattered areas that are not readily arable. Altogether, several hundred thousand leafhoppers were collected, of which over 30,000 were mounted for study and added to the 5,000 specimens already in the Survey collection. Because of the size of the group it was decided to exclude from the present report the large subfamily Cicadellinae (formerly Typhlocybinae).

During the period of the 1930's, the taxonomic status of many leafhopper genera was in a state of flux, because of the increasing employment of genitalic characters for specific identification. In consideration of this, the preparation of the final leafhopper manuscript was postponed for several years pending studies of various large genera such as *Gypsona* and *Idiocerus*.

A large portion of the identifications and preparation of the manuscript was done by

Dr. DeLong at Columbus, Ohio, and we are very grateful to him for contributing so much of his own time to this project. We also wish to express our gratitude to Dr. Herbert Osborn of Ohio State University, Dr. P. W. Oman and Dr. H. E. Dorst of the U. S. Department of Agriculture, and Dr. R. A. Beamer of the University of Kansas for the loan of drawings or cuts, for permission to use illustrative material, or for other assistance; and to Miss Ruth V. Hershberger of Ohio State University for making many drawings of diagnostic parts.

Several members of our staff in the Section of Faunistic Surveys and Insect Identification have contributed materially to the project. All members of the section have assisted with the field program. The original total views of leafhoppers are the work of Dr. Carl O. Mohr, Associate Entomologist and Artist. Mrs. Elizabeth N. Maxwell, Artist, has contributed many drawings of diagnostic parts used in the subfamily and generic keys, and she and the Survey draftsman, Mr. James W. Curfman, have assembled, numbered, and lettered the plates. Miss Phyllis A. Beaver, Laboratory Assistant, assembled and summarized the Illinois records in our files, and Dr. B. D. Burks, Associate Taxonomist, prepared the bibliography. Adapting the manuscript to current Survey practices, modifying the keys to emphasize as much as possible characters that could be illustrated, and integrating in our office the many parts of the manuscript represent the painstaking and effectual work of Dr. Milton W. Sanderson, Associate Taxonomist. The index to scientific names was made by Mrs. Leonora K. Gloyd, Laboratory Assistant. We have enjoyed throughout the help and cooperation of the Survey Technical Editor, Mr. James S. Ayars.

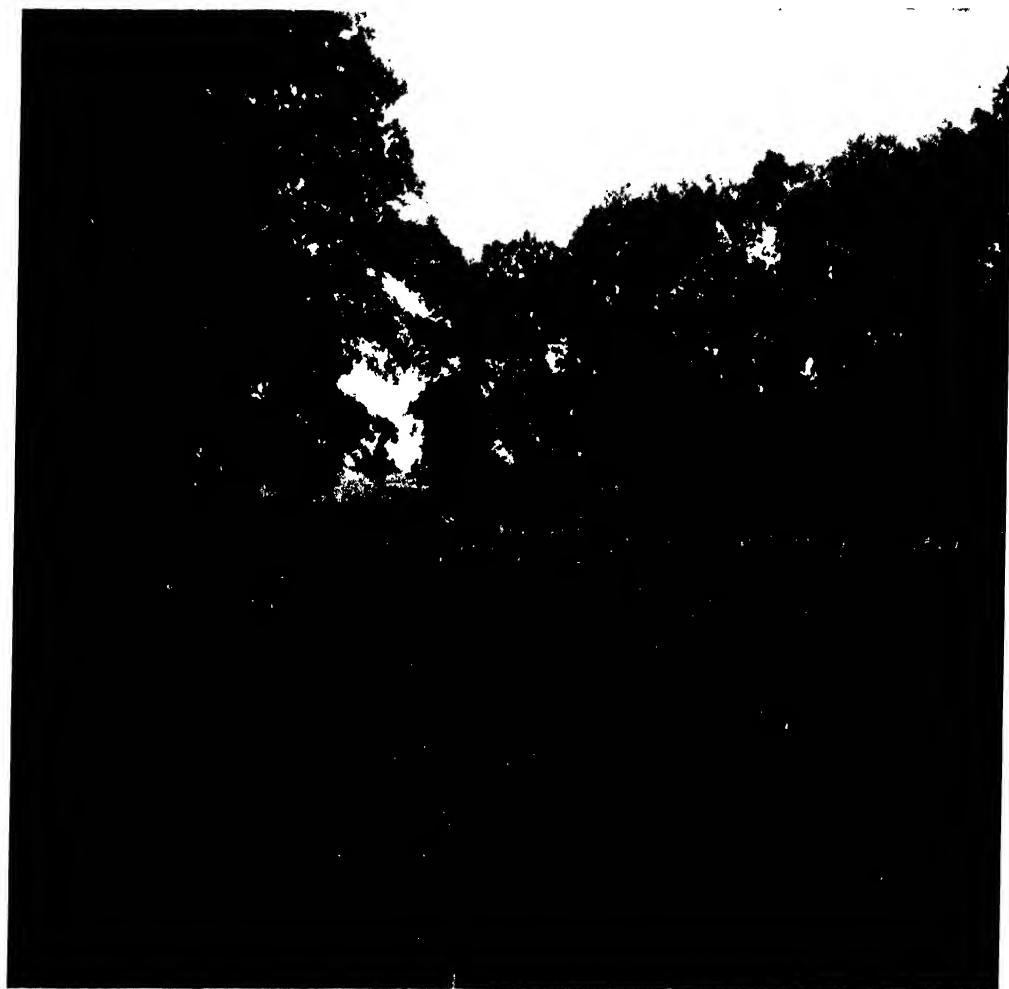
HERBERT H. ROSS,  
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An area of marsh grasses in an oak woods near Amboy, Illinois. The diversity of plant species in this spot makes it an ideal collecting ground for leafhoppers. Distinctive forms of trees, shrubs, herbs, or grasses all occur within this small area.

# The Leafhoppers, or Cicadellidae, of Illinois

(Eurymelinae-Balcluthinae)

D. M. DELONG

THE leafhoppers, or Cicadellidae, constitute one of the largest families of insects in North America and also in the entire world, rivaling in number of species such groups as the rove beetles, or Staphylinidae, the hymenopterous family Ichneumonidae, and the weevil family Curculionidae. When complete, the Illinois list of leafhoppers will probably be close to 700 species. This report deals with about half of the Illinois leafhopper species, comprising 16 subfamilies. The other half belongs to the large subfamily Cicadellinae, which is not treated in this report except for a key to the genera.

Three hundred thirty species of the subfamilies here treated are recorded from Illinois. Additional species whose range indicates that they might be found in the state with subsequent collecting have been added to the keys for the purpose of giving a more thorough understanding of the Illinois species.

Many leafhopper species are economically important, either inflicting direct damage to crops, or transmitting plant diseases. These species are difficult to differentiate from many forms considered to be of little or no economic importance. One of the principal aims of this report is to set forth keys and illustrations for their identification.

## BIOLOGY

Some species of leafhoppers pass the winter in the egg stage and others in the adult stage. Overwintering eggs, present in plant tissues, hatch somewhat late in the

spring, usually in May or June, and the nymphs feed on the new, tender leaves. Species of leafhoppers that pass the winter as adults normally come out of their hibernation quarters during the first warm days of spring and begin to lay eggs as soon as the leaves of their host are fully developed. These eggs hatch in about 10 days. There are five nymphal instars in the life cycle before the adult stage, which usually requires from 12 to 30 days, depending upon the species and the climatic conditions. As a rule, leafhoppers have one or two generations per year but, where completion of the cycle is rapid and cropping conditions or sequence of plants furnishes an abundance of food, other generations may be produced. *Empoasca fabae*, the potato leafhopper, and certain species of *Erythroneura* produce probably the largest number of broods.

About 10 years ago, the writer (1938a) reported in some detail upon the biology of the potato leafhopper, which might serve as a specific example for the discussion of various biologic phenomena and developmental stages. The adults of this species may mate within 24 hours after emergence; the preoviposition period may be as short as 3 days and it averages less than 6 days. The eggs are inserted singly into tender stems of leaf veins. The number of eggs produced varies considerably in this species. In general, the females lay eggs for a month or more and produce about 75 eggs in this period. In 1926 one second generation female produced 226 eggs in 47 days, an average of 4.8 eggs per day. The highest daily egg-laying record was 8 eggs in a 24-hour period. In the same year, 51 females

produced 2,327 eggs. One female deposited 195 eggs over a period of 92 days and another 216 eggs in 85 days. The average incubation period for 1,964 observations during a single season was approximately 10 days. The minimum incubation period observed was 7 days and the maximum 19 days. There seems to be a definite correlation with temperature conditions.

In the process of hatching, the nymph pushes itself through the egg membrane and the plant epidermis; at this time the legs extend tightly along the ventral side of the body to the tip of the abdomen. By a backward and forward swaying motion of the body the legs are freed; then the tip of the body is soon freed, and the nymph becomes active upon the plant. The time required for nymphal development varies from a minimum of 10 to a maximum of 22 days, depending upon temperature. The average number of days from egg to adult is usually 12 to 14 in a normal season.

Four distinct broods of the potato leafhopper occur, the fourth giving rise to only a small number of individuals in the northern states.

**Hibernation.**—Several common species of leafhoppers are known to pass the winter in hibernation as adults in leaf mold and under the loose bark of trees. Species of *Agallia*, *Macrosteles*, *Balclutha*, *Polyamia*, *Laevicephalus*, *Paraphlepsius*, *Deltoccephalus*, *Exitianus*, and especially species of *Erythroneura* and *Empoasca* have been collected in hibernation and have been found coming out of hibernation in early spring. A large number of species of *Erythroneura* have been described from hibernating specimens only and nothing is known of their food plant and their relationship to plant associations.

Field observations and hibernation experimentation indicate that each spring *Empoasca fabae* migrates from the southern states into the northern states and does not normally pass the winter out of doors in Illinois or states of similar latitude.

**Feeding Habits.**—Insofar as known, all leafhoppers are plant feeders that, in feeding, puncture the tender plant tissues by piercing-sucking mouthparts. Such feeding studies as have been made indicate that most species feed upon the mesophyll and cause a white stippled appearance upon the foliage. *Empoasca fabae* and probably other species make exploratory punctures deep into the

tissue, causing the mechanical plugging of xylem and phloem vessels.

Not infrequently leafhoppers bite humans. Biting is common in certain leafhoppers attracted to lights, especially in little green species of the genus *Empoasca*. Their bite is sharp, but usually produces itching of only short duration.

## ECOLOGICAL RELATIONSHIPS

The leafhoppers are usually restricted to definite plant species or genera. The plants are in turn limited in their distribution to definite habitats due largely to climatic and edaphic conditions. As a result a species of leafhopper or a group of species can usually be associated with a definite habitat or plant association. The leafhoppers, however, are not invariably found wherever their hosts occur. Some species of leafhoppers seem to be distributed throughout the full range of their food plant, whereas others seem to be restricted by climatic factors to an area within the food plant range. This latter condition is exemplified by the species of *Idiocerus* occurring on *Crataegus*, which do not occur, apparently, throughout the entire range of their respective plant hosts.

The state of Illinois, with its long north and south axis and varied conditions, exhibits a variety of plant associations which afford interesting collecting and a variety of interesting northern, southern, and western species of leafhoppers. A large percentage of leafhopper species feed upon grasses, sedges, or herbaceous plants, and the varieties of prairies, sandplains, meadows, and marshes furnish excellent opportunities for obtaining many interesting records.

**Sand Habitats.**—The sand prairies along the upper Mississippi River at Fulton, Hanover, and Thomson, fig. 1, which are unique in the plant association of the state, contain species of leafhoppers that apparently do not occur elsewhere in Illinois. Such species as *Flexamia grammica*, which occurs on the large coarse sand reed (*Calamovilfa longifolia*), and *Polyamia herbida*, which is found on the short matted grasses of the same habitat, have not been discovered elsewhere in the state. In the same habitat occur *Flexamia areolata* and *abbreviata*, *Polyamia rossi*, *Hebecephalus cruciatus*, *Paraphlepsius solidaginis*, and *Chlorotettix brevidus*, in addition to several more common species.

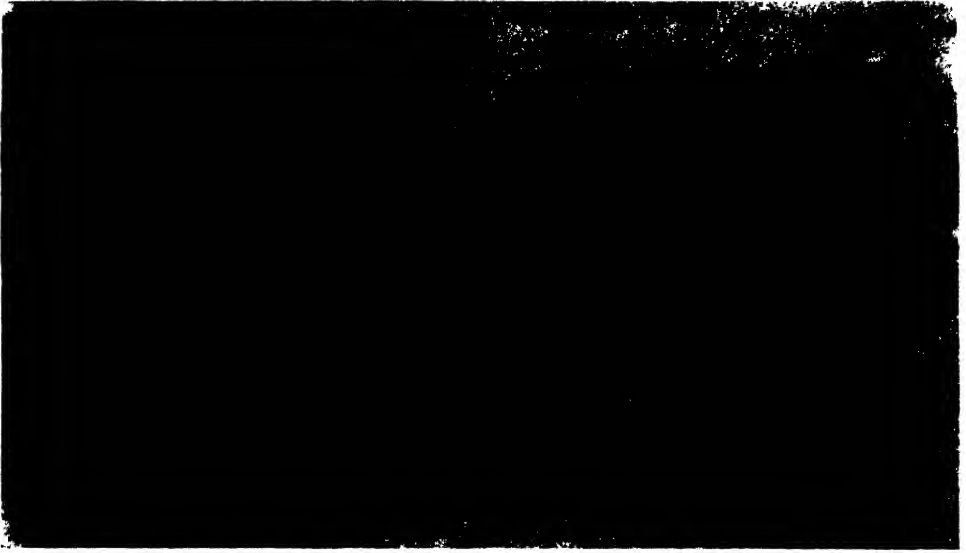


Fig. 1.—Sand prairie at Thomson, Illinois. Many unusual leafhoppers of the genera *Flexamia* and *Polyamia* are found in such situations.

In the sand prairie at St. Anne in the eastern portion of the state south of Chicago, we also find *Flexamia areolata*, and in addition *Flexamia bidentata*, *Chlorotettix borealis*, and *Paraphlepsius maculosus*. On scrub oak in the same area occur *Eutettix pictus* and *Penthimia americana*. On the grasses of a different type of prairie, at Des Plaines,

where wild rose is a prominent plant species, *Laevicephalus praeus* occurs. The high well-drained prairie at Decatur contains two interesting western species of leafhopper, the "long-nosed" *Dorycephalus platyrhynchus* and the small striped *Commellus comma*. On the hot barren denuded soil in the Mississippi River valley at Alton are



Fig. 2.—Swale and sand dunes along the edge of Lake Michigan near Zion, Illinois. Many host plants of northern leafhopper species are restricted in Illinois to this area.



Fig. 3.—Mats of bearberry, *Arctostaphylos uva-ursi*, on the sand ridges along Lake Michigan, near Zion, Illinois. This plant is the sole host for *Texananus cumulatus*.

small patches of sparse short grasses upon which was found *Athysanella balli*.

At Zion, Illinois, the sand prairie along the shore of Lake Michigan presents still another habitat type, fig. 2. Here the short grasses are mixed with prostrate mats of bearberry (*Arctostaphylos uva-ursi*) and ground juniper (*Juniperus horizontalis*).

On the grasses are such species as *Paraphlepsius turpiculus*, *Dorydiella kansana*, *Graminella mohri*, and *Graminella oquaka*. *Dorydiella kansana* has been taken from *Scleria verticellata* in the *Eleocharis obtusa* association, and *Graminella mohri* occurs on *Andropogon furcatus*. The mats of bearberry, fig. 3, support large populations of

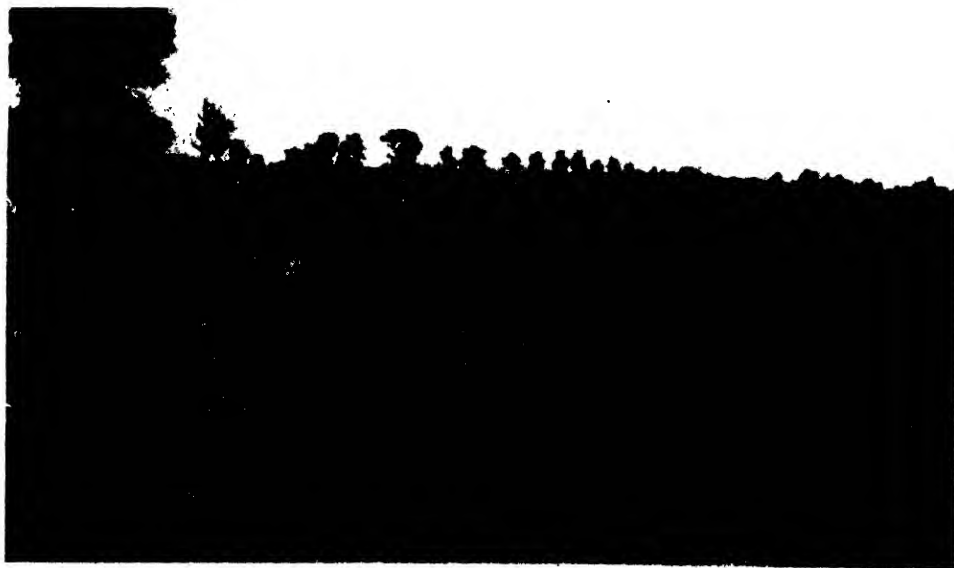


Fig. 4.—In the old Lake Michigan basin south and west of Chicago, near Oak Lawn and Evergreen Park, are many remnants of prairies such as this. They support a leafhopper fauna of unusual interest.

*Texanans cumulus*, which apparently is limited in Illinois to this area alone.

The old Lake Michigan basin, south and west of the city of Chicago, presents a series of dry and wet prairies, fig. 4, which vary considerably in their plant composition. Certain portions of this area near Evergreen Park and Oak Lawn have been collected extensively with interesting results. At Evergreen Park on a heavy mat of prairie grasses *Flexamia rubranura*, *picta*, *inflata*, *Laevicephalus unicoloratus*, and *Remadosus magnus* were taken. A typical prairie species, *Mesamia nigridorsum*, was found abundantly on wild sunflower throughout this prairie. On a moister portion of the prairie, species collected included *Graminella aureovittata*, *Chlorotettix rugicollis*, *spatulatus*, *fallax*, and *Dorydiella kansana*, which seem entirely out of their range, since most of them except *Chlorotettix spatulatus* and *Dorydiella kansana* have been described from and occur either in Florida or along the Gulf or South Atlantic Coast. On small areas in this same Oak Lawn region where the water table is high and mats of fine *Eleocharis* occur, *Deltoccephalus gnarus* is found.

**Isolated Grass Areas.**—Some of the most interesting captures were made in areas where isolated islands of more western vegetation are still present. One such area is a pure stand of small grass several feet square which is growing upon the high exposed cliffs west of the stream at White Pines Forest State Park. *Laevicephalus minimus* was collected in abundance in this habitat. On the shaded grasses under the pine trees *Palus delector* was found.

A similar type of habitat was found at Apple River Canyon State Park. There a stream has cut a deep gorge, leaving high rock-faced cliffs upon which are several types of wooded and herbaceous vegetation. Species like *Chlorotettix unicolor* and *balli* are rather abundant on the grasses of the flood plain. The grasses in the wooded areas support *Chlorotettix lusorius* and *Colladonus furculatus*. The entomologist who wishes to expend the energy to climb to the top of the rugged cliffs and search out small patches of short grasses is well repaid for his efforts by finding *Flexamia pectinata* in specific spots or pockets on the western cliffs. East and south of the Canyon in a similar situation *Polyamia dilata* and *saxosa*, rare in the state, and *Hebecephalus signati-*

*frons* may be found. The last mentioned species is more often found west of Illinois and may reach its eastern limit in this state.

**Marshes.**—Marsh grasses and sedges furnish another series of interesting habi-



Fig. 5.—Meadows of *Calamagrostis* and associated grasses in old lagoons of Lake Michigan, near Zion, Illinois.

tats. Along Lake Michigan, from Waukegan to Zion, extensive meadows of *Calamagrostis*, fig. 5, and associated grasses have developed from the old lagoons which were originally formed along the shores of Lake Michigan by wave action. On these grasses occur *Amplicephalus osborni*, *Limotettix striolus* and *parallelus*, *Chlorotettix spatulatus*, *fallax*, *obsenus*, and *Hecalus lineatus*. In the swamp portion, where the water table is closer to the surface, *Macrosteles potoria* and *slossoni* are found.

At the shallow margins of Fox Lake, fig. 6, and other northern Illinois lakes are often formed large areas that are filled with species of *Typha*, *Spartina*, and associated sedges and grasses. These associations abound in *Cicadula cyperacea*, *melanogaster*, and *smithi* (on *Spartina Michauxiana*) and *Euscelis sahlbergi*. The smaller grasses in these habitats often support species of *Paraphlepsius*, such as *humidus* and *altus*. In other marshes, fig. 7, are clumps of sedges





Fig. 6.—Marshes of varied floral content along the edges of Fox Lake, Illinois. Here is found a large variety of sedge and grass feeding leafhoppers.

that harbor *Laevicephalus shingwauki* and *Parabolocratrus viridis*.

Associated with the cypress swamps of southern Illinois, as at Karnak and Olive Branch, are marshes that contain tall grasses and sedges upon which occur *Chlorotettix dentatus*, *melanotus*, and *limosus*.

In the marshes of the Chicago area is an abundance of *Hecalus lineatus* and *Para-*

*bolocratus viridis*, *major*, and also *grandis*.

The tamarack bog at Volo contains large areas of *Vaccinium*, fig. 8, upon which live species of *Ophiola*.

**Woodland Areas.**—One of the most interesting habitats found in the state is the Herod flood plain, a low flat wooded area which is only a few feet above the stream bed and which is furnished with a high



Fig. 7.—Especially rich in leafhopper species are marshes such as this one at Volo, Illinois, along the edge of a tamarack bog.

water table and a resultant moist soil condition, thus producing a luxuriant growth of vegetation composed of cane (*Arundinaria tecta*), several types of grasses, many

species found in this association are *Polyamia interrupta*, *Chlorotettix nudatus*, *Iusorius melanotus*, and *Paraphlepsius fulvidorsum*. Where *Impatiens* is found growing

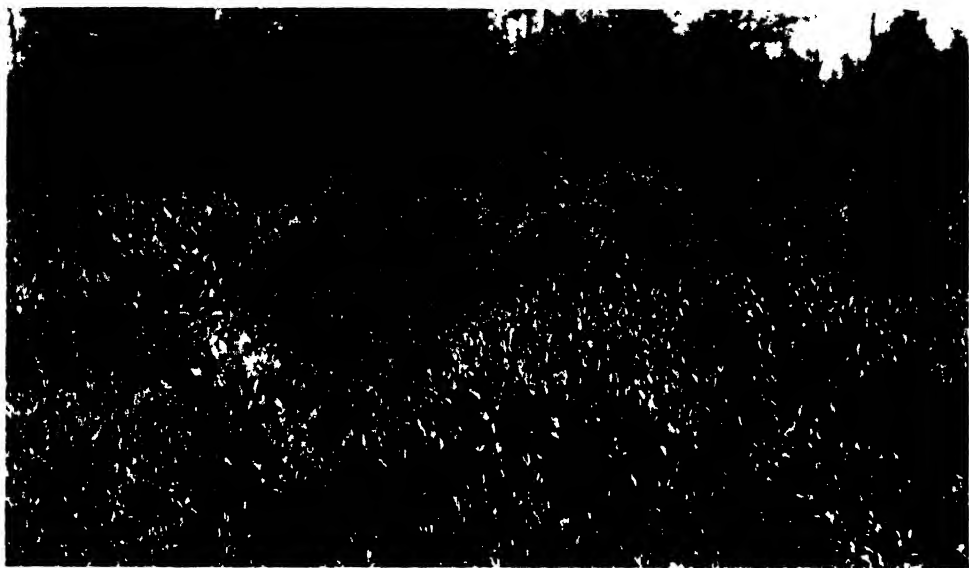


Fig. 8.—Leafhoppers of the genus *Ophiola* are found on *Vaccinium*, which grows extensively in a bog near Volo, Illinois.

annual herbaceous plants, and a few perennials. On the cane were found several species of *Arundanus*, namely, *naevosus*, *flavotinctus*, *marginellus*, and *arundineus*, *Chlorotettix suturalis*, and *Polyamia arundinea*. The grasses and herbaceous plants support several species, the more interesting of which are *Chlorotettix iridescens*, *balli*, and *nudatus*, *Paraphlepsius rossi*, *Kolla geometrica*, and *Polyamia alboneura*. Upon the small grasses at the margin of the stream in this shaded habitat is found *Polyamia brevipennis*.

The wooded areas, fig. 9, produce a variety of types of associations in different areas of the state. A wooded glen at Rocky Branch, Dolson, proved to be one of the areas containing the greatest abundance of species of leafhoppers. Several species of *Gloanthanus* and several species of *Scaphoideus* including *nigrellus*, which was taken only at this point, occur in this association. The association is composed of an open mixed mesophytic forest with a luxuriant growth of shrubs and herbaceous vegetation, some of which occur in rather low moist areas and some of which are found only on well-drained slopes. Some common

in shaded areas, *Macrosteles variata* occurs.

Near Shawneetown in the Ohio River area are shaded meadow grasses in low areas; upon the luxuriant growth occur such species as *Chlorotettix attenuatus* and *balli* and *Paraphlepsius latifrons*. At Vienna and Savanna where other types of open woodland are found, *Ophiola anthracina* and *Osbornellus unicolor* occur on the herbaceous vegetation.

In several places such as Oakwood and Eichorn, large patches of wild rice (*Elymus*) are growing in shaded places along streams or in low flat woods. On this food plant are found specimens of *Elymana inornata* and *acrita*.

The woodland trees themselves, in addition to furnishing shaded conditions for herbaceous plants, support several species of leafhoppers. Certain genera are apparently limited in their feeding habits to species of trees. As an example many of the species of *Idiocerus* occur upon willows: *Idiocerus snowi*, *alternatus*, *pallidus*, and *moniliferae*. In addition *Macropsis viridis*, *Empoasca obtusa*, *Neokolla hieroglyphica*, and other leafhoppers are found on willows. The

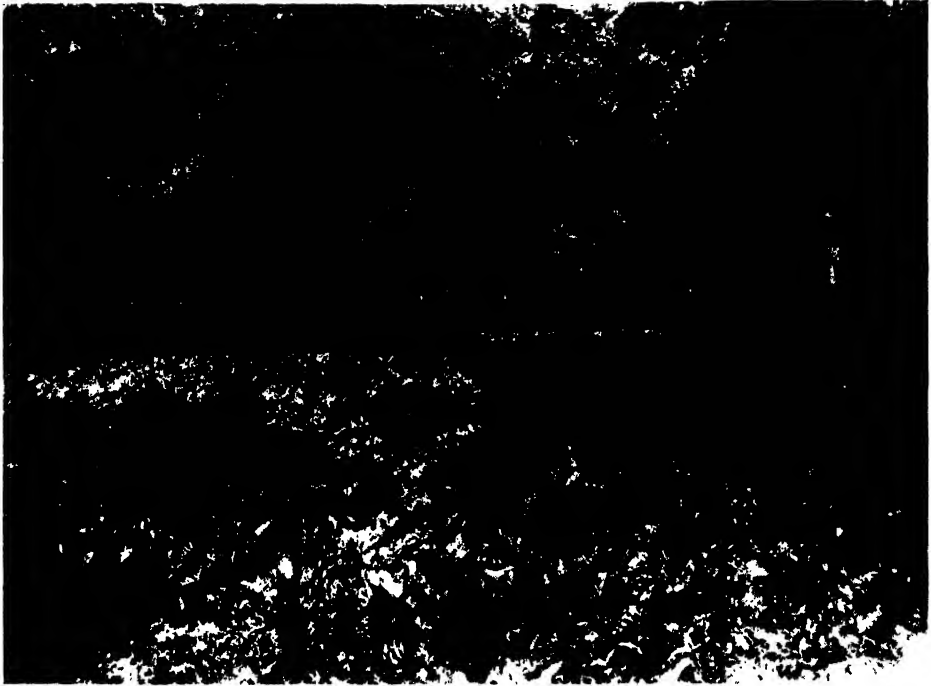


Fig. 9.—A lush growth of herbs in a wooded glade at Starved Rock State Park, Illinois. Such a habitat supports a leafhopper fauna very different from that found in the prairies.



Fig. 10.—Holling hills near Elizabeth, Illinois. Both the open prairie and the hazel and aspen clumps (center background) have a distinctive leafhopper fauna.

Carolina poplar is a tree occurring in the same habitat with the willow which supports species of *Idiocerus* and *Macropsis*. Upon Lombardy poplar have been found *Idiocerus scurrus* and *Fieberiella florii*; the latter species also occurs upon some of the ornamental shrubs. A common ornamental shrub, *Tamarix*, which grows wild in certain areas of the United States, supports large populations of a bright green leafhopper, *Opsius stactogalus*. Certain species of oak are food plants for *Alebra albostrigella*, *Eutettix pictus* and *luridus*, and *Penthimia americana*. The maples are usually infested with *Japananus hyalinus*. The walnut is the food plant for *Oncopsis verticis*, and the honey locust supports *Stragania apicalis* and *Macropsis fumipennis* var. *gleditschiae*. Species of *Crataegus* are the food plants of *Idiocerus crataegi*, *fitchi*, and *provancheri*. Certain species of *Scaphoideus*, *Gyponana*, and *Ponana* live normally upon American elm. *Idiocerus hebetus* is a common species on quaking aspen. *Scaphoideus opalinus*, *Idiocerus apache* var. *juniperus*, and *Empoasca junipera* are common species on juniper. These and many other species occur upon our common species of trees, but more especially should be mentioned the fact that practically all species of forest and shade trees are food plants for many species of *Erythroneura*, *Empoasca*, and *Typhlocyba*, genera which have been mentioned only superficially in the present study.

**Open Hillside.**—The hillside pastures and short grass meadows of the Ozark foothills in the southern portion of the state present interesting associations and here many species have been taken in a single pasture. Space prevents the enumeration of all such species but the more common and interesting are *Acurhinus pyrops*, *Paraphlepsius irroratus*, *truncatus*, *tennessa*, and *pusillus*, *Texananus superbus*, *Chlorotettix galbanatus*, *necopinus*, and *viridius*, *Polyamia inimica*, *weedi*, *obtecta*, and *similaris*, *Flexamia picta* and *inflata*, and *Deltocephalus sonorus* and *flavicosus*.

The hillside pastures of the Jo Daviess hills, fig. 10, in the northwestern corner of the state contain several of the same species. In addition to those, *Athyasella acuticauda* is a common species in this northwestern pasture region. Many other species of leafhoppers occur on the open prairie and in the hazel and aspen clumps of this part of the state.

## ECONOMIC STATUS

Several species of Illinois leafhoppers are known as pests of various plants and crops. Thin piercing-sucking mouthparts injure plants by piercing the cells and vessels of the leaf or stem and sucking out the plant fluids. Slight injury may also be caused by the egg punctures of the larger species, which oviposit in leaf tissues.

The potato leafhopper, *Empoasca fabae*, is a major pest of potatoes in Illinois. The browning and curling leaf injury known as hopperburn apparently is caused by this leafhopper through the plugging of the conductive tissues of the stalks or veins. Where such injury occurs it prevents the manufacture and translocation of starches in the plant and usually the formation of potato tubers. This type of injury is not produced by other species of leafhoppers.

The rapid multiplication and growth of potato leafhoppers results in heavy populations and severe injury to potatoes in seasons of normal climate. Heavy populations of this pest also cause injury to other crops. Beans are injured by a cupping or curling of the leaves with the top of the leaf appearing humped. A hopperburn condition is often produced on rhubarb. On alfalfa a yellowing of the leaves is caused by leafhoppers, and young apple trees are frequently injured by the insects, which cause a severe curling of the newer leaves.

Apples are injured severely in certain seasons by leafhoppers of several genera. Species of *Erythroneura* and *Typhlocyba*, as well as *Empoasca*, cause damage, and species of *Gyponana*, *Idiocerus*, and other genera may occasionally become pests. The more abundant and common species infesting apples are *Erythroneura lawsoniana*, *maculata*, *obliqua*, *hartii*, and *zicmac*, *Typhlocyba pomaria*, and *Empoasca fabae* and *maligna*.

The species of *Erythroneura* hibernate as adults and lay eggs on the young developing shoots or leaves of apple in May and June. The eggs of *Typhlocyba pomaria*, *Empoasca maligna*, and of species of *Gyponana* and *Idiocerus* pass the winter in the bark of twigs and hatch early in the spring. In view of this fact, the populations upon the apple tree are composed of a complex of adults and immature forms of the various species. Severe populations cause the leaves to become stippled with white puncture

spots and often to turn brown and fall. When the apples are ripening in the autumn, the populations are often so abundant that the fruit is coated with "honeydew" excretions. It is common for the sooty fungus to grow in this excretion. The large *Gypsonana* leafhoppers make rather large egg punctures in the new twig growth. These leafhoppers probably are not of economic importance, but they leave large scars and occasionally become abundant. It is difficult to control them.

Certain species of *Erythroneura*, especially *comes* and *trinicta*, usually become pests of grapes, attacking the leaves and causing them to turn whitish, then yellow, and finally brown before they fall to the ground prematurely. By the time this partial defoliation occurs, the grapes are fully developed but not matured. The green leaves are necessary to produce the sugars for maturing the fruit. As a result of leafhopper attack, the marketed grapes are often sour and the quality is decidedly impaired by leafhopper defoliation.

Clover and alfalfa harbor a number of leafhopper species, among which are *Aceratagallia sanguinolenta*, known as the clover leafhopper, *Polyamia inimica*, *Unerus nigrifrons*, *Exitianus obscurinervis*, *Macrosteles divisa*, *Agallia constricta*, *Cloanthanus frontalis* and *acutus*, and *Empoasca fabae*. The most severe leafhopper pest of alfalfa is undoubtedly *Empoasca fabae*.

Forage crops of all kinds are attacked by leafhoppers, which are usually considered as minor pests of these crops but occasionally become quite abundant. The leafhoppers most often present on forage crops are *Draeculacephala* spp., *Graminella nigrifrons*, *Polyamia inimica*, *Exitianus obscurinervis*, *Macrosteles divisa*, *Psammotettix striatus*, *Paraphlepsius irroratus*, and *Cloanthanus* spp.

In addition to causing injury by direct attacks, certain species of leafhoppers are important as vectors in the transmission of plant diseases. The sugar beet leafhopper, *Norvellina tenella*, one of the best known of this group, transmits to sugar beet and other plants the virus disease causing curly top. In the early 1930's this disease was found on horse-radish in Illinois, associated with large populations of the vector. That infestation was apparently caused by a migration; leafhopper and disease disappeared in 1937 and have not recurred in Illinois since.

*Macropsis trimaculata* has been proved to transmit yellows, a disease fatal to peach trees. *Macrosteles divisa*, a common species on many types of plants, has been proved to be vector of another virus disease, aster yellows.

Where cranberries are grown commercially in the northern bog areas, *Ophiola striatula* and *osborni* are pests; the former has been demonstrated to be the vector of a virus disease known as false blossom of cranberries. Yellow dwarf of potatoes has been readily transmitted by *Aceratagallia sanguinolenta*.

## TAXONOMY

The Cicadellidae are most readily distinguished from other families of Homoptera by two rows of prominent spines on the long hind tibiae. The head usually bears two ocelli well separated from the large compound eyes by the basal portion of the vertex. Throughout the group the vertex varies greatly in length and general structure. In some genera it is very short and parallel margined and in others extremely long and foliaceous. Each of the first pair of wings has a definite claval area and a corium. The clavus in some genera is reticulate veined. In most genera the corium is crossed by two veins, frequently called the first and second sectors; the first sector is branched on the corium, forming an outer and inner branch; and there are usually one or two crossveins between the first and second sectors, always a row of apical veins, and usually a row of anteapicals. In a few species both brachypterous and macropterous forms occur.

In size, individuals of this group range from 3 to 12 millimeters in length. Usually the females are larger than the males and often differ from them in color and structure.

Some of the more recent and useful papers on the taxonomy of leafhoppers are by Johnson (1935) on the Cicadellinae (Typhlocybinae) of Ohio, Oman (1937, 1938a) on some North American and South American leafhopper genera, and Osborn (1928) on Ohio leafhoppers. Other useful works are a publication on Minnesota leafhoppers by Medler (1942), and a check list of Nearctic leafhoppers by DeLong & Knull (1945). These references contain many bibliographic citations to the Cicadellidae.

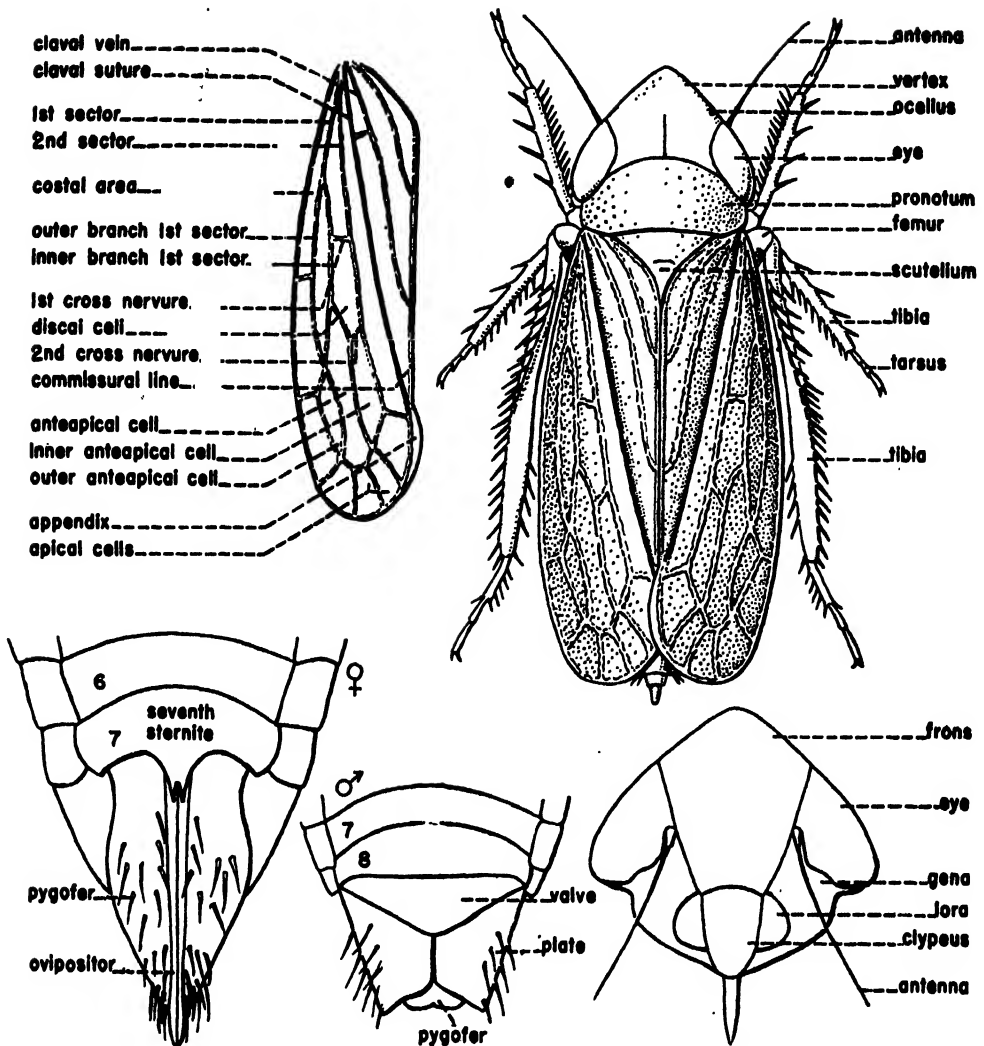


Fig. 11.—*Latulus configuratus*. Figures illustrating terminology for parts of body, elytron, and male and female external genitalia.

**Systematic Characters.**—The Cicadellidae are divided into subfamilies chiefly on the basis of position of ocelli, sutures of head, shape of pronotum, and venation, fig. 11. The general type and comparative length of head and the curvature of the vertex or the presence or absence of a foliaceous margin assist in the separation of genera in certain groups. Wing venational patterns, the presence or absence of certain branches, and the presence or relative numbers of reticulate crossveins or reflexed costal veinlets are valuable characters for generic distinctions. In the Cicadellinae the second pair of wings contains diagnostic

venational characters in addition to those in the first pair of wings. The generic separation of the members of this subfamily may be accomplished almost entirely upon the basis of wing venation. The male genital structures often assist in placing a species in its genus even though the entire specimen except this portion may be missing.

In most leafhopper groups the internal chitinous pieces of the male genitalia, fig. 12, are the most reliable structures known to date for specific diagnosis. In certain genera, those of the Macropsinae for example, we have been unable to date to distinguish the species by the genitalia; hence their species

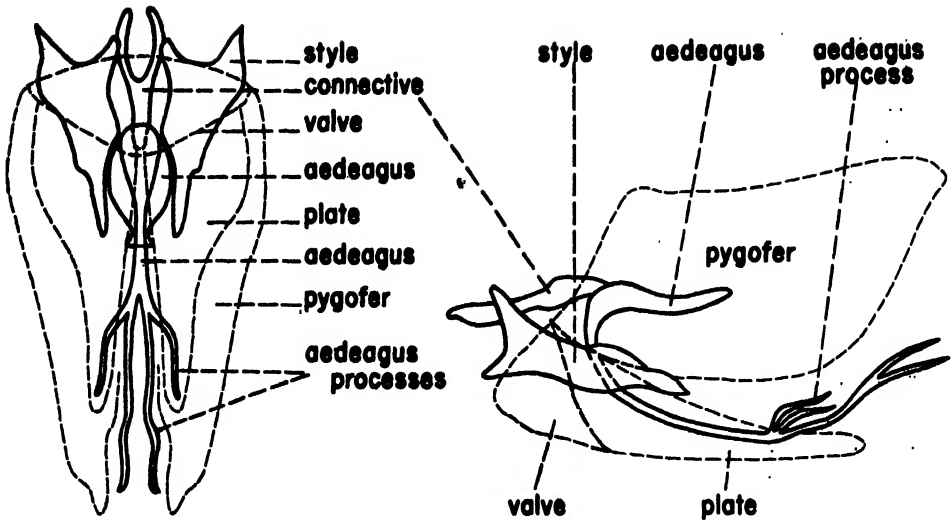


Fig. 12.—*Chlorotettix dentatus*. Figures of male internal and external genitalia illustrating terminology of parts.

are separated largely on the basis of color patterns. The external structures of the male are often very useful for separating species, but as a rule the internal structures of the genital cavity are more specific, especially the aedeagus and paired styles. In certain genera the shape and excavation or curvature of the posterior margin of the seventh sternite of the female, designated in some publications as the last ventral segment, is excellent for species separation. In other groups, the female seventh sternite in as many as 50 or more similarly colored or marked species may be identical. In such cases it is almost impossible to key the females to species. Insofar as possible, both sexes have been keyed to species in this report. Even when not used in the keys, the male genital structures have been illustrated if of value in assisting students to check the identity of species.

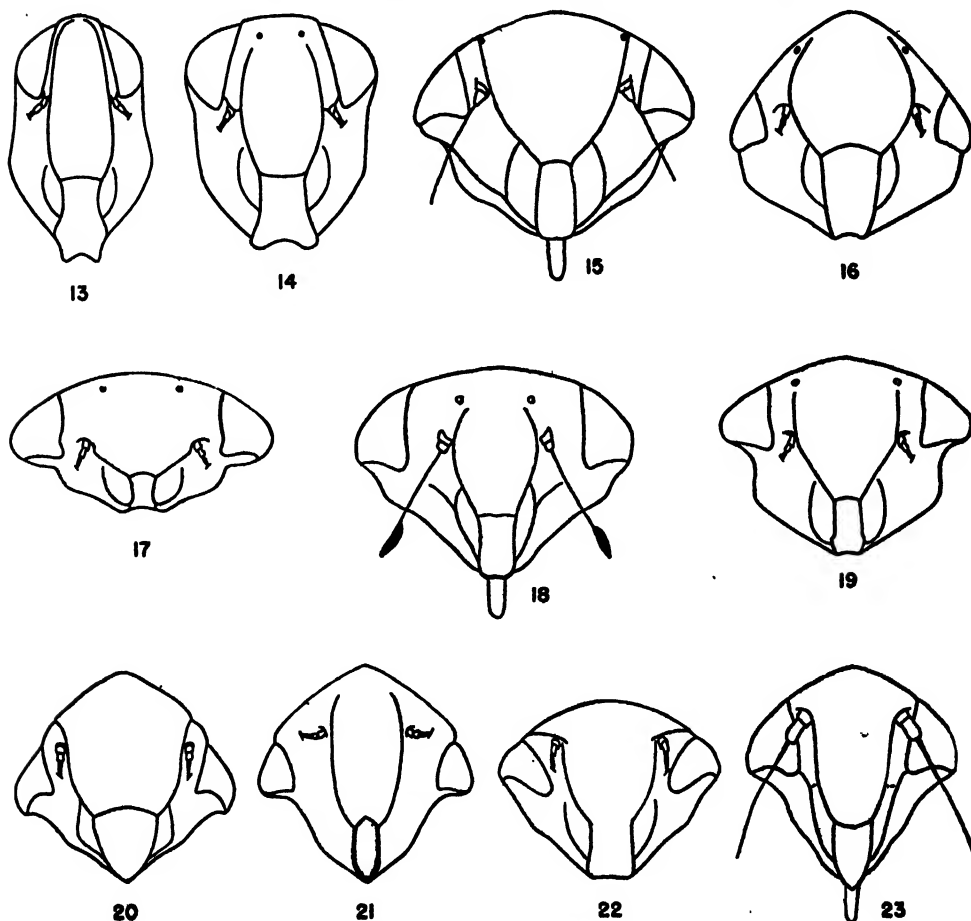
The keys to the subfamilies and genera were devised largely for the separation of the members of groups known to occur in Illinois and nearby states.

#### KEY TO SUBFAMILIES

1. Frons long and nearly parallel sided or a little narrowed dorsad, figs. 13, 14; eyes large and separated on meson by less than greatest width of eye, fig. 24. . . . .*Jassinæ*, p. 343
- Frons expanding dorsad, as in figs. 15, 16; eyes smaller and usually separated on meson by one or more times width of eye. . . . .2

2. Vertex between eyes very short and from 5 to 13 times wider than median length, as in figs. 26, 29; ocelli on extreme front margin of vertex or on face, as in figs. 17, 18. . . . .3
- Vertex between eyes generally long and 2 to 4 times wider than median length, as in figs. 28, 31; ocelli above, or on front margin of vertex, or absent, as in figs. 27, 31. . . . .9
3. Anterior margin of pronotum extended beyond a line through the anterior margins of eyes, as in fig. 26. . . . .4
- Anterior margin of pronotum not extended beyond anterior margins of eyes, as in figs. 27, 29. . . . .6
4. Frontal suture extending beyond antennal pit and curved on inside of ocellus, fig. 16; veins of elytra each with a double row of punctures on margins, fig. 95. . . . .*Nioninæ*, p. 131
- Frontal suture ending at or near antennal pit, figs. 92, 93; veins of elytra without punctures. . . . .5
5. Vertex obtusely angulate, fig. 26; anterior margin of pronotum produced from one-third to nearly one-half its length beyond anterior margins of eyes; head and pronotum punctured or with irregular raised lines. . . . .*Macropsinæ*, p. 123
- Vertex broadly rounded, figs. 96, 104; anterior margin of pronotum produced not more than one-fifth or one-sixth its length beyond anterior margins of eyes; head and pronotum finely granulate. . . . .*Agalliinæ*, p. 132
6. Frontal suture extending beyond antennal pit nearly to ocellus, as in fig. 19; head wider than pronotum; elytra bare between veins. . . . .7
- Frontal suture ending at antennal pit, as in fig. 17. . . . .8

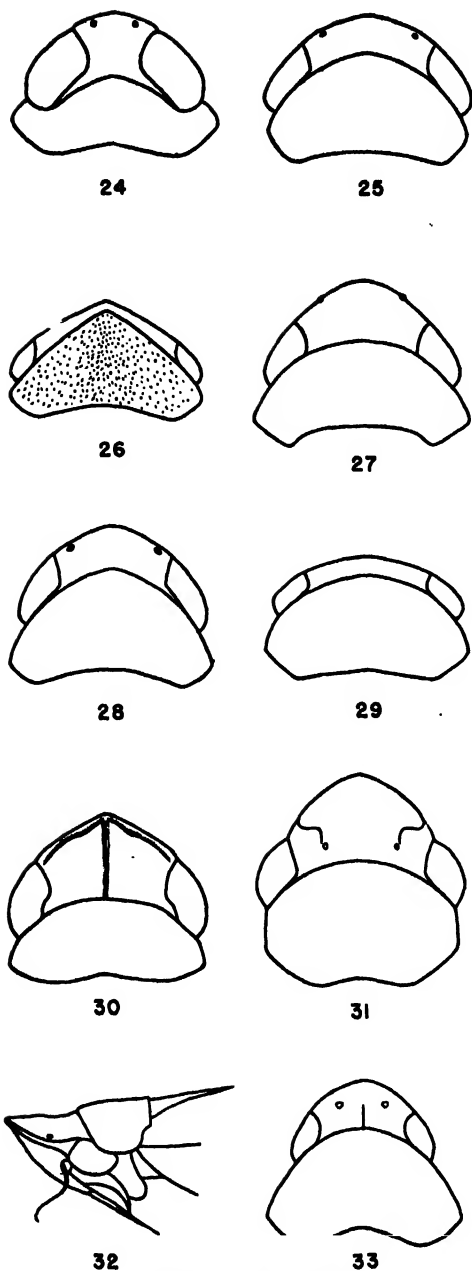
7. Body large and robust, the elytra inflated behind; ocellus, fig. 19, closer to eye than middle of vertex and directly above antennal base. The genus *Remadosus* in . . . . . *Athysaninae*, p. 181  
 Body slender, fig. 34, the elytra narrowed behind; ocellus, fig. 18, almost exactly halfway between eye and middle of vertex on inside of a perpendicular line through antennal base. . . . . *Eurymellinae*, p. 111
8. Head, fig. 29, narrower than pronotum; elytra with many short hairs between veins. . . . . *Bythoscopinae*, p. 138  
 Head, fig. 98, wider than pronotum; elytra bare. The genus *Aceratagallia* in . . . . . *Agalliinae*, p. 132
9. A median longitudinal carina on front and on vertex, and another extending from inner margin of eye to middle of front margin, fig. 30. . . . . *Evacanthinae*, p. 153  
 Carina absent on front and only occasionally present on vertex. . . . . 10
10. Ocelli on disc of vertex between eyes but remote from eyes and anterior margin, figs. 31, 33. . . . . 11  
 Ocelli, when present, on or near anterior margin of vertex, as in figs. 205, 206. . . . . 14
11. Each clavus without veins or stripes; terminal membrane of each elytron, fig. 152B, wide on inside and broadly overlapping at suture; body short and broad, with apex of elytra conspicuously sloping. . . . . *Penthimiinae*, p. 154  
 Each clavus with one or more distinct veins or veinlike dark stripes, as in figs. 128-130; terminal membrane on



Faces of Cicadellidae

Fig. 13.—*Tinobregmus viridescens*.Fig. 14.—*Jassus olitorius*.Fig. 15.—*Chlorotettix unicolor*.Fig. 16.—*Nionia palmeri*.Fig. 17.—*Stragania apicalis*.Fig. 23.—*Typhlocyba tunicarubra*.Fig. 18.—*Idiocerus lachrymalis*.Fig. 19.—*Remadosus magnus*.Fig. 20.—*Neokolla hieroglyphica*.Fig. 21.—*Xerophloea major*.Fig. 22.—*Ponana quadralaba*.





Heads of Cicadellidae

- Fig. 24.—*Jassus olitorius*.  
 Fig. 25.—*Nesosteles neglectus*.  
 Fig. 26.—*Macropsis viridis*.  
 Fig. 27.—*Xestocephalus pulicarius*.  
 Fig. 28.—*Balclutha abdominalis*.  
 Fig. 29.—*Stragania apicalis*.  
 Fig. 30.—*Evacanthus acuminatus*.  
 Fig. 31.—*Neokolla hieroglyphica*.  
 Fig. 32.—*Aphrodes nervosus* ♀.  
 Fig. 33.—*Gyponana octolineata*.

- inner margin of each elytron at apex narrow, and at most only narrowly overlapping; body more elongate. . . . . 12
12. Frontal sutures extending over anterior margin of vertex nearly to ocelli, figs. 20, 31; margin of vertex very blunt and broadly rounded to front, or bulbous. . . . . *Tettigoniellinae*, p. 139
- Frontal sutures terminating below anterior margin of front, as in figs. 21, 22; margin of vertex not more than slightly thickened, sometimes thin and foliaceous. . . . . 13
13. Clypeus, fig. 21, small, oval, very convex; antennal pit with a slight rounded convexity in front; dorsum, fig. 182, nearly uniformly covered with deep rounded pits. . . . . *Ledrinae*, p. 169
- Clypeus, fig. 22, larger, parallel sided, slightly convex; antennal pit with a distinct transverse sharp ridge above, reaching eye; body not pitted though shallowly punctured along veins. . . . . *Gyponinae*, p. 155
14. Elytra, fig. 403, short and broadly rounded, exposing five or more abdominal segments; nearly all veins, if distinct, reaching apical margin and usually without closed cells on disc before elytral apex, as in fig. 237. . . . . *Athysaninae*, p. 181
- Elytra long, as in fig. 229, and exposing at most the tip of abdomen; at least two or more distinct cells on disc of each elytron, as in figs. 200, 230. . . . . 15
15. Elytral nervures usually not branching on disc and without crossveins anterior to apical crossveins, figs. 490-499; ocelli often absent; lorae usually long and narrow, fig. 23. . . . . *Cicadellinae*, p. 349
- Either elytral nervures branching on the disc, or crossveins present anterior to apical crossveins, figs. 211-230; ocelli usually present; lorae not especially elongated, fig. 15. . . . . 16
16. Ocellus distant from eye, located approximately half way between inner margin of eye and middle of front margin, fig. 27. . . . . 17
- Ocellus very close to eye at no more than one-third the distance between inner margin of eye and middle of front margin, and situated on front margin or only slightly behind, as in figs. 186A, 188. . . . . 20
17. Vertex raised in front of and above eye so that eye appears to be somewhat sunken in head, fig. 487. . . . . *Neocoelelidinae*, p. 345
- Vertex not raised in front of or above eye, the vertex appearing to be nearly continuous with eye, as in fig. 25. . . . . 18
18. Margin of vertex bluntly to evenly rounded to face, fig. 197, and with ocelli situated on or appearing to touch extreme front margin when viewed from above, fig. 27. . . . . 19
- Vertex more angulate with the front, and with ocelli a little behind front margin. . . . . *Aphrodinae*, p. 178
19. Head narrower than pronotum, fig. 27;

- apexes of elytra mottled brown. The genus *Xestocephalus* in.....
- .....**Aphrodinae**, p. 178
- Head wider than pronotum, fig. 463; apexes of elytra not mottled brown, though often dark with light veins. The genus *Cicadula* in.....
- .....**Athysaninae**, p. 181
20. Vertex produced, anterior margin thin, sharp, and foliaceous, figs. 186-190....
- .....**Dorydinae**, p. 170
- Vertex often flattened and acutely angled but rarely thin, sharp, and foliaceous on entire margin, figs. 200, 210..... 21
21. Inner sector of forewing twice forked, forming three anteapical cells, fig. 214; hind wing with four apical cells.....
- .....**Athysaninae**, p. 181
- Inner sector of forewing not forked, with two anteapical cells, fig. 213; hind wing with three apical cells..... 22
22. Head distinctly narrower than pronotum, or, if as wide, then with vertex broad, almost parallel margined, scarcely produced at middle, and without definite color markings, figs. 28, 488.....
- .....**Balcluthinae**, p. 346
- Head as wide as or wider than pronotum, figs. 469, 472; vertex produced at middle, usually bluntly angled, marked with black spots or broken transverse bands.....
- .....**Athysaninae**, p. 181

### Subfamily EURYMELINAE

The members of this subfamily are wedge shaped in appearance and have short broad vertexes that are rounded to the front; the ocelli are on the face. Each of the forewings has a large and distinct appendix.

This group is represented in the United States by only one genus, *Idiocerus*.

#### 1. *IDIOCERUS* Lewis

*Idiocerus* Lewis (1835, p. 47).

Fig. 34. Head short, broader than pronotum. Vertex short, parallel margined, and broadly rounded to front. Male antennae frequently bearing characteristic discs near their apexes. Elytra usually longer than abdomen, narrow, each with a distinct appendix, narrowly rolled or folded at apex.

So far as is known this group is entirely tree or shrub inhabiting, and the greater number of species occur on willow, poplar, aspen, and species of *Crataegus*. About 75 species and varieties occur in the United States; 17 have been collected in Illinois.

#### KEY TO SPECIES

1. Vertex without definite round black spots on margin, figs. 35-45..... 2

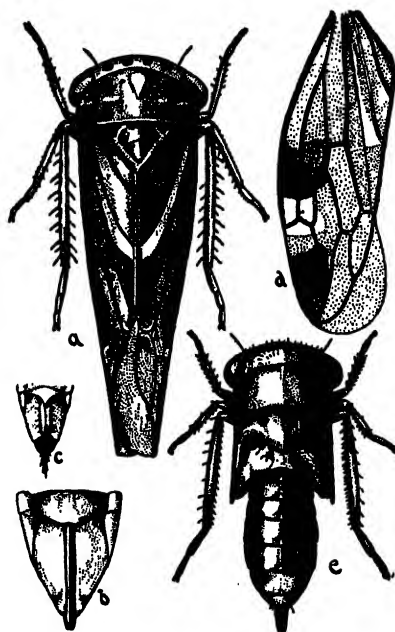
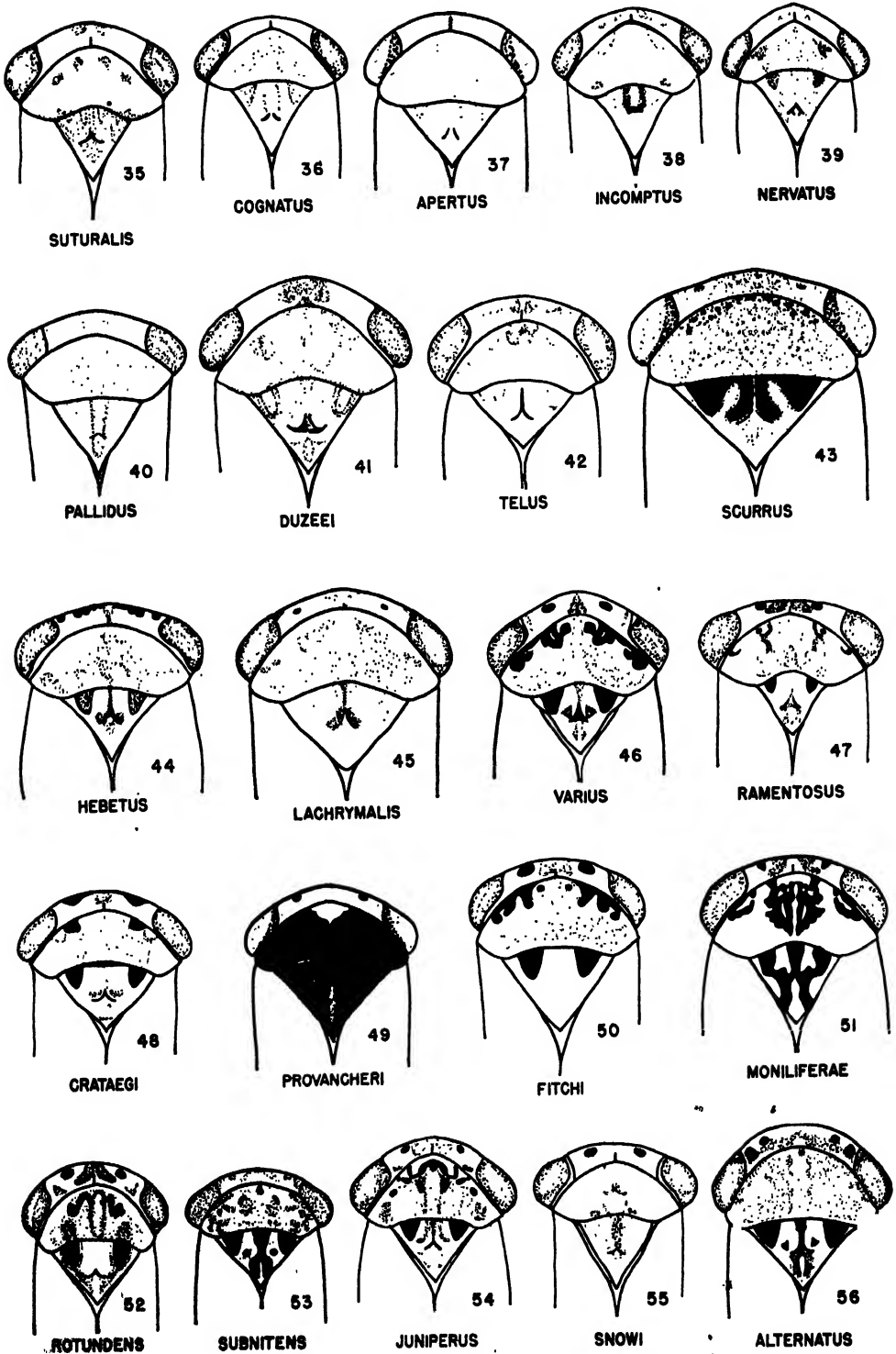
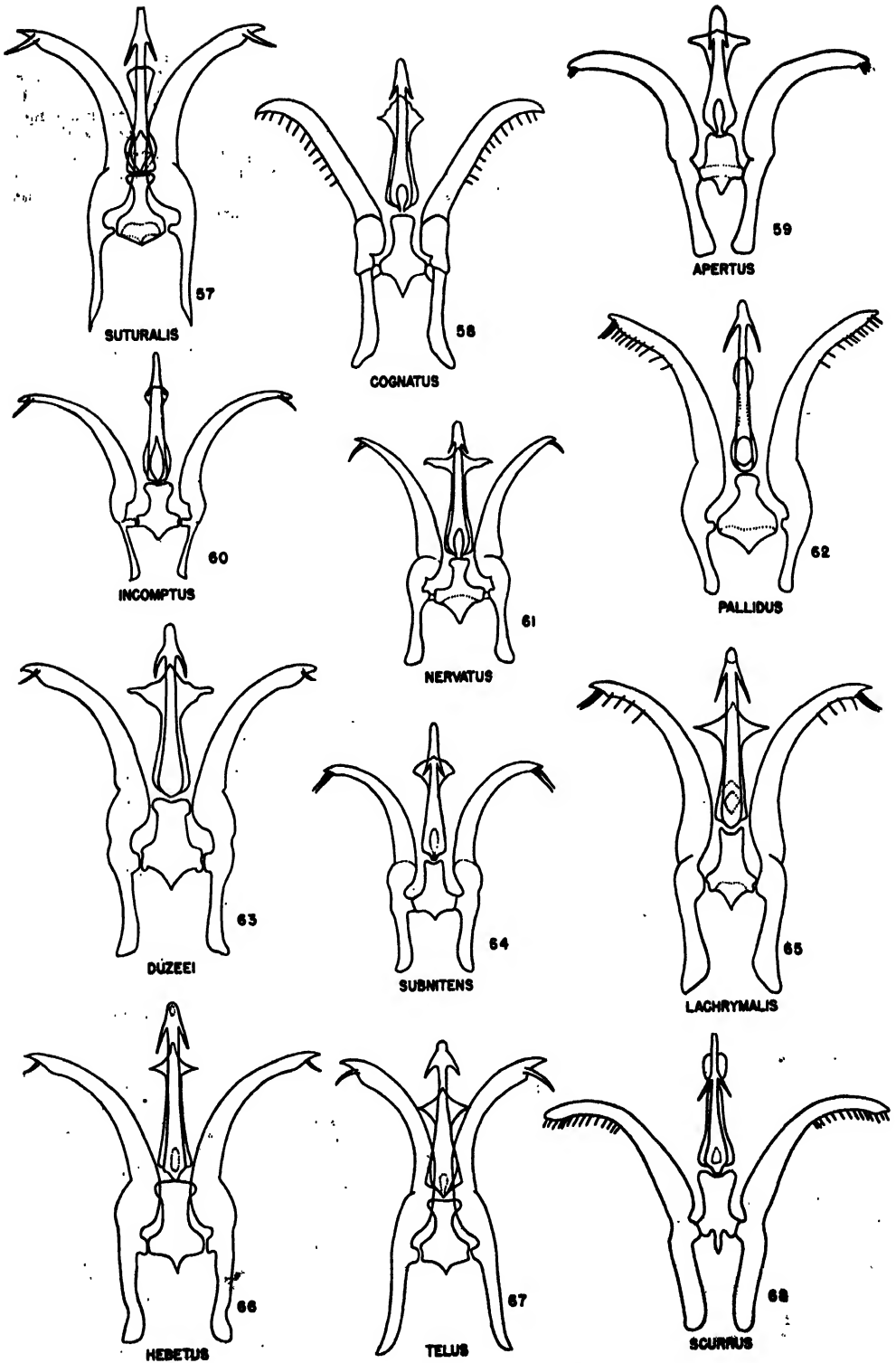


Fig. 34.—*Idiocerus fitchi*: a, adult; b, female genitalia; c, male genitalia; d, elytron; e, nymph. (From Osborn.)

- Vertex marked with two or more round black spots on margin, figs. 46-56.... 12
2. Pale yellow or green, with a broad fuscous stripe arising on scutellum, fig. 35, and extending along inner margins of elytra to apex of clavus, often broken or interrupted..... 1. *suturalis*
- Green, yellow, or brown, but without a stripe along inner margins of elytra... 3
3. Length not exceeding 5.0 mm..... 4
- Length 5.5 mm. or more..... 7
4. Pronotum and scutellum irrorate, fig. 37; elytra fuscous, costal margins white....
- ..... 3. *apertus*
- Pronotum and scutellum not irrorate, elytra not fuscous; color pale green or yellow..... 5
5. Elytra pale, faintly banded by pale bronze or fuscous transverse bands; each male antenna simple..... 2. *cognatus*
- Elytra pale, not banded or marked; each male antenna with small disc..... 6
6. Dorsal portion of aedeagus, fig. 60, terminating in a small narrow rounded process..... 4. *incomptus*
- Dorsal portion of aedeagus, fig. 61, transverse, with lateral pointed processes widely produced..... 5. *nervatus*
7. Elytra green or iridescent gold, not marked with brown..... 8
- Elytra brown, with pale markings, or pale, with brown markings..... 10
8. Elytra white or pale green; each male antennal disc elongate, ovate..... 9
- Elytra iridescent gold; each male antennal disc broader, elongate, subovate..... 7. *duzei*



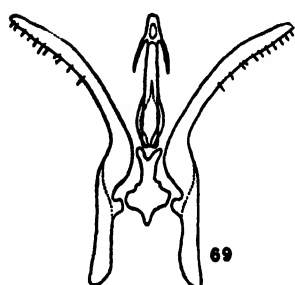
**Figs. 35-56.**—*Idiocerus*, head, pronotum, and scutellum. Color patterns and shapes of typical representatives of 22 species are shown.



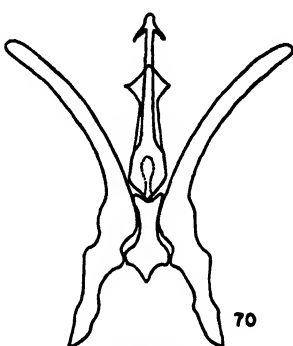
Figs. 57-68.—*Idiocerus*, male genitalia.

9. Dorsal portion of aedeagus, fig. 62, narrow and rounded at apex; spines at terminus of ventral portion long, not webbed to aedeagus shaft.....6. *pallidus*  
Dorsal portion of aedeagus, fig. 67, terminating in a broad diamond-shaped process; spines at the terminus of ventral aedeagus process appearing webbed to aedeagus shaft.....8. *telus*  
10. Elytra brown, with pale spots on veins, especially on each clavus; each male

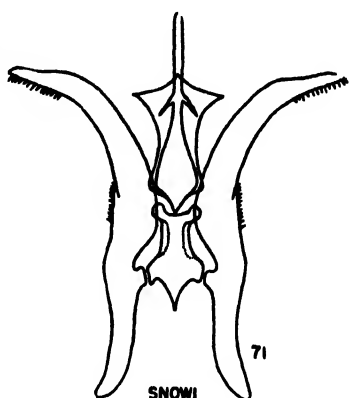
- antenna simple, without disc.....9. *scurrus*  
Elytra white, veins marked with brown; each male antennal disc large, elongate, and black.....11  
11. Pale, without conspicuous dark markings, fig. 44; each style, fig. 66, with one prominent spine at apex; diamond-shaped terminus of dorsal aedeagus process small.....10. *hebetus*  
Usually with darker conspicuous color



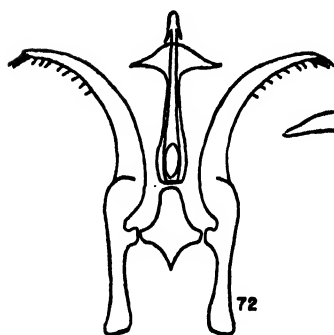
RAMENTOSUS



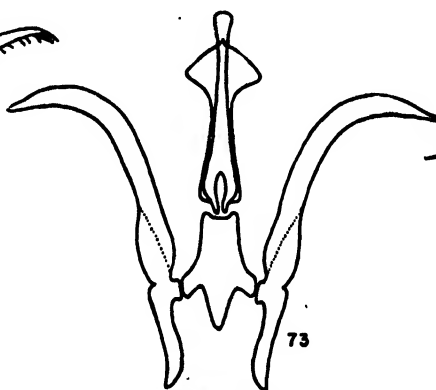
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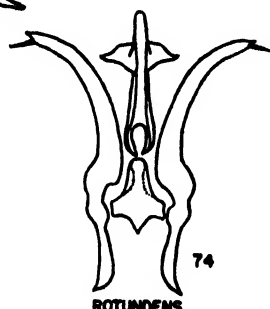
SNOWI



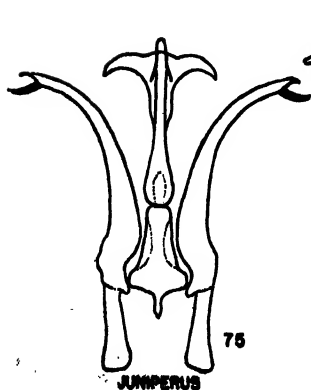
ALTERNATUS



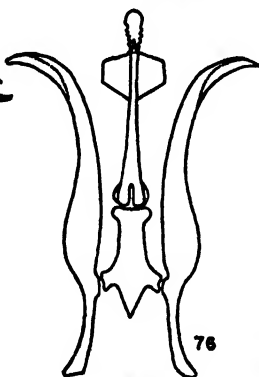
PROVANCHERI



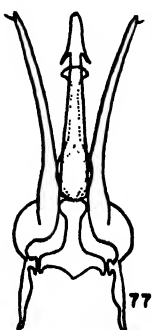
ROTUNDENS



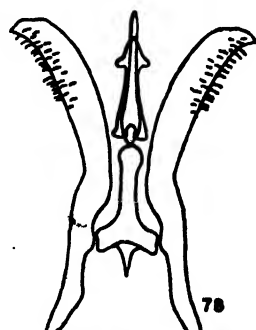
JUNIPERUS



FITCHI

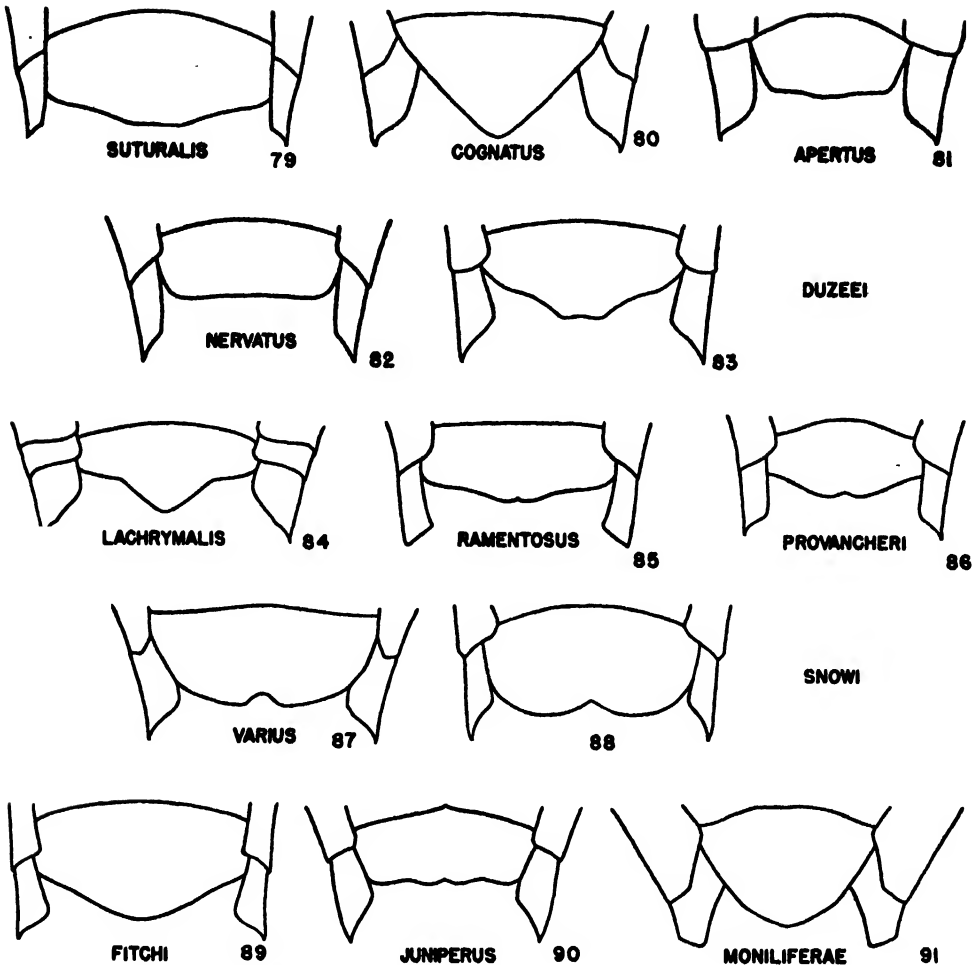


VARIUS



MONILIFERA

Figs. 69-78.—*Idiocerus*, male genitalia.



Figs. 79-91.—*Idiocerus*, female seventh sternite.

- markings; each style, fig. 65, with two prominent proximal parallel spines at apex; diamond-shaped terminus of dorsal aedeagus process large, conspicuous, ..... *lachrymalis* (see 10. *hebetus*)
12. Elytra marked with a white transverse band at apex of each clavus..... 11. *subnitens*  
Elytra often mottled but without a white transverse band at apex of each clavus..... 13
13. Vertex marked by a transverse brownish band variously intensified, as in figs. 44, 45, frequently enclosing the round black spots..... 14  
Vertex without a transverse brown or black band..... 15
14. Pale, without conspicuous dark markings; style, fig. 66, with one prominent spine at apex; diamond-shaped terminus of dorsal aedeagus process small..... 10. *hebetus*  
Usually with darker conspicuous color markings; style, fig. 65, with two promi-

- nent proximal parallel spines at apex; diamond-shaped terminus of dorsal aedeagus process large, conspicuous..... *lachrymalis* (see 10. *hebetus*)
15. Black spots on vertex large, appearing proximal to eyes..... 16  
Black spots on vertex not more than half as large, often very small, appearing more distant from eyes..... 19
16. Color rather uniform, pale or dull brown, without markings; elytra brownish hyaline, veins often darker..... 12. *ramentosus*  
Color not uniform, but pale brown marked with black and yellow, or dark brown, with pale markings..... 17
17. Dirty yellow to pale gray; a pair of black spots on anterior margin of pronotum, fig. 48; basal angles of scutellum black; elytra pale, subhyaline, veins brown..... 13. *crataegi*  
Dark brown or chestnut brown, pronotum and scutellum with pale markings..... 18
18. Basal two-thirds of elytra entirely white,

- tinted with yellow except for a broad black band on inner margin next to scutellum; scutellum, fig. 49, nearly uniform chestnut brown. .... 14. *provancheri*
- Basal portion of each clavus pale brown, with darker veins and a small white spot at apex of second claval vein; scutellum, fig. 50, mostly brown, lateral and apical portions white. .... 15. *fitchi*
19. Elytra marked by two faint transverse bronze or pale brownish bands. .... 2. *cognatus*
- Elytra marked with dark brown and without definite bands. .... 20
20. Veins concolorous or uniform yellowish; body pale in color. .... 21
- Veins alternately white and dark brown; body darker in color. .... 22
21. Length 5.25–5.75 mm.; usually with a narrow brown stripe extending along claval portion of inner margins of elytra; each male antenna without disc. .... 16. *snowi*
- Length not exceeding 5.0 mm.; basal angles of scutellum, fig. 52, with brown triangular spots, but without markings on elytra; each male antenna with large oval disc. .... 17. *rotundens*
22. Brownish in color; veins alternately brown and white, not conspicuously marked; each male antennal disc elongate, black. .... 23
- Darker brown, more heavily marked on vertex, pronotum, scutellum, and elytra, fig. 51; veins broadly, heavily, and more conspicuously marked with alternating brown and white areas; each male antenna simple, without disc. .... 21. *moniliferae*
23. Dorsal process of aedeagus, fig. 77, small, rounded at apex, scarcely broader than ventral aedeagus shaft. .... 18. *varius*
- Dorsal process of aedeagus broad, terminal processes laterally pointed or hooked, as in figs. 72, 75. .... 24
24. Dorsal aedeagus process, fig. 75, with lateral terminal portions bent anteriorly, gradually curved concavely on anterior margin to median shaft. .... 19. *apache* var. *juniperus*
- Dorsal aedeagus process, fig. 72, with lateral terminal projections sharp pointed and straight, abruptly narrowed anteriorly to shaft of aedeagus. .... 20. *alternatus*

### 1. *Idiocerus suturalis* Fitch

*Idiocerus suturalis* Fitch (1851, p. 59).

Fig. 35. Length 5.0–5.75 mm. Pale yellow, with a dark brown stripe along the suture of elytra, this sometimes interrupted, but often continuing to scutellum and pronotum. Vertex unmarked. Elytra yellowish hyaline, apexes smoky. Male antennal discs elongate, black. Female seventh sternite, fig. 79, with posterior margin rather

strongly and roundedly produced. Male plates narrow and elongate. Each style, fig. 57, tapered on anterior margin just before apex, with a single apical spine; ventral portion of aedeagus with rather long slender barbs at base of the terminal head; dorsal portion of aedeagus rounded at base and apex, constricted at middle, the apical portion gradually broadened to about three times the width of the shaft, the apical margin broadly rounded.

This species is widely distributed in the eastern United States, and ranges west to Colorado. It has been taken from willow, poplar, and birch.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 1 ♂; June 29, 1935, DeLong & Ross, 1 ♂, 2 ♀. GALENA: July 8, 1917, 1 ♀; June 20, 1932, Dozier & Mohr, 2 ♂; July 10, 1934, DeLong & Ross, 4 ♂, 5 ♀. GRAND DETOUR: July 2, 1932, Dozier & Mohr, 1 ♀. MCHENRY: July 31, 1884, 1 ♀. OAK LAWN: Aug. 24, 1933, Frison & Ross, 6 ♀. PUTNAM: July 6, 1934, Ross & DeLong, 1 ♀.

### 2. *Idiocerus cognatus* Fieber

*Idiocerus cognatus* Fieber (1868, p. 455).

Fig. 36. Length 4.5–5.0 mm. Pale, appearing faintly banded. Female usually with two small but well-defined black spots on vertex. Male with spots often faint or wanting. Face pale, with a central spot above extending on to vertex, with the small black spots either side. Pronotum pale gray with margins lighter; yellowish. Scutellum pale brown. Each elytron pale, subhyaline, veins of apical fourth brown, a brownish band at middle formed by a brownish coloration on veins. Each male antenna simple. Female seventh sternite, fig. 80, slightly but broadly and roundedly produced. Male plates elongate, narrow. Each style, fig. 58, rather broad and uniform in width throughout apical half, pointed at apex; ventral portion of aedeagus with a headlike structure, at the base of which is a pair of short barblike spines; dorsal portion of the aedeagus broadened and pointed on each lateral margin and bluntly pointed at apex.

This species has been found commonly in the eastern United States on *Populus alba*.

**Illinois Record.**—URBANA: Aug. 16, 1934, DeLong & Ross, 3 ♂.

### 3. *Idiocerus apertus* DeLong & Hershberger

*Idiocerus apertus* DeLong & Hershberger (1947, p. 46).

Fig. 81. Length, male 4.5 mm. In form and general appearance similar to *nervatus*, but pale brownish in color. Vertex, fig. 37, broadly rounded, a little shorter at middle than next to eyes; yellowish, tinted with brown, the central portion brownish. Disc of pronotum, basal angles of scutellum, and basal portions of elytra tinted with brown. Elytra subhyaline, with pale brownish veins. Male plates elongate, rather narrow, apices broadly rounded. Styles, fig. 59, strongly curved outwardly, apex of each bluntly pointed and bearing a pair of conspicuous spines; aedeagus with ventral portion forming a slightly enlarged apical head that has a barbed spine at base on either side; dorsal portion not quite so long as ventral and broadened at apex to form a pointed protrusion at either side and a broad slightly produced apical margin.

This species probably occurs in the southern portion of the state. It has been collected in Tennessee.

### 4. *Idiocerus incomptus* DeLong & Hershberger

*Idiocerus incomptus* DeLong & Hershberger (1947, p. 45).

Fig. 38. Length 4.5 mm. Resembling *nervatus* in form and coloration, but with distinct male genitalia. Color pale green to yellow green, without markings except pale brownish spots on basal angles of scutellum. Elytra subhyaline, with pale veins. Dark veins of under wings conspicuous from above. Face pale, slightly infuscated above. Each antennal disc slightly enlarged, elongate, black at apex. Male plates elongate, rather narrow, apices broadly rounded; each style, fig. 60, rather narrow and tapered about two-thirds of its length to form pointed apex, which bears a large spine; ventral portion of aedeagus only slightly narrowed from base to apex, the latter rounded and bearing a short spine on either side about one-fifth the distance from apex; dorsal portion of aedeagus constricted at middle, forming a rounded portion at base, which is distinctly wider than the ventral process, and also forming a smaller rounded portion just slightly wider than the ventral

process at apex; terminal rounded portion ending just anterior to spines of ventral process.

Illinois Record.—HORSESHOE LAKE: cypress, July 11, 1935, DeLong & Ross.

### 5. *Idiocerus nervatus* Van Duzee

*Idiocerus nervatus* Van Duzee (1894b, pp. 194, 205).

Fig. 39. Length 4.0–4.5 mm. Small, pale green, without dark markings on vertex. Basal angles of scutellum brown, and the brown nervures of the wings conspicuous through the pale greenish hyaline elytra. Each male antenna with small disc. Female seventh sternite, fig. 82, with posterior margin broadly truncate. Male plates long and narrow. Each style, fig. 61, gradually tapered on apical half to rather narrow apex and bearing a single prominent spine; ventral aedeagus bearing a headlike portion with a pair of very short barblike spines at base; dorsal aedeagus portion abruptly broadened at apex to form a short broad process pointed on each lateral margin and bluntly pointed at apex.

This species occurs on willows with *pallidus*, which it closely resembles. It can be distinguished by its smaller size and the dark basal angles of scutellum. It is widely distributed in the eastern United States and the Middle West and ranges west into Arizona and California.

Illinois Records.—Many males and females, taken March 24 to October 2, are from Algonquin, Alto Pass, Apple River Canyon State Park, Ashley, Carlinville, Cave in Rock, Chemung, Dongola, Fountain Bluff, Fox Lake, Geff, Gibsonia, Golconda, Havana, Herod, Horseshoe Lake, Jonesboro, Kampsville, Kankakee, Meredosia, Mount Carmel, Onarga, Oquawka, Paxton, Putnam, Quincy, Rock Island, Starved Rock State Park, Urbana, White Heath, and Zion.

### 6. *Idiocerus pallidus* Fitch

*Idiocerus pallidus* Fitch (1851, p. 59).

*Bythoscopus obsoletus* Walker (1851a, p. 873).

Fig. 40. Length 6.0–6.5 mm. White, tinged with green, unmarked, elytra subhyaline, nervures indistinct. Eyes reddish brown; antennal discs large. Female seventh sternite broadly and roundedly produced;



the central portion produced beyond rounded margin. Male plates slender and elongate. Each style, fig. 62, slightly narrowed on apical third, rather abruptly narrowed at apex and pointed at tip; ventral aedeagus with a slightly enlarged apical head, at the base of which is a pair of long slender spines; dorsal aedeagus rounded at base and apex and constricted at middle; apical portion only slightly wider than aedeagus shaft.

This is the common species of leafhopper on willow and poplar, and it is transcontinental in distribution.

**Illinois Records.**—ALCONQUIN: July 12, 1895, 1 ♂; July 19, 1895, 1 ♂; July 23, 1895, 2 ♂; July 26, 1895, 1 ♂; Aug. 12, 1895, 1 ♂; July 17, 1896, 3 ♂, 2 ♀. NIOTA: dry bog, July 28, 1936, Mohr & Burks, 1 ♀.

### 7. *Idiocerus duxeei* Provancher

*Idiocerus duxeei* Provancher (1890, p. 292).

*Idiocerus perplexus* Gillette & Baker (1895, p. 78).

Fig. 41. Length 6–7 mm. Resembling *pallidus*, but larger, broader, and pale yellowish green, the elytra golden iridescent, apices fuscous. The coloration at apices of elytra more pronounced in male than in female. Male antennal discs elongate ovate. Female seventh sternite, fig. 83, with posterior margin concavely rounded to a produced, broadly rounded median third. Male plates elongate and narrow. Each style, fig. 63, rather broad, slightly narrowed between apical portion and middle, apex abruptly narrowed to pointed tip and bearing a single spine; ventral aedeagus portion with a slightly enlarged head, which has a pair of rather long basal spines; dorsal aedeagus portion greatly enlarged at apex and angularly pointed laterally on each side and at apex.

A common species on cottonwood, *duxeei* occurs in the eastern United States and west to Colorado. It is widely distributed throughout Illinois and probably occurs wherever its host is found.

**Illinois Records.**—Males and females, taken June 14 to August 2, are from Alton, Cache, Elizabeth, Elizabethtown, Freeport, Galena, Grafton, Havana, Kampsville, Niota, Normal, Olive Branch, Pike, Putnam, Vienna, Volo, Wauconda, and White Heath.

### 8. *Idiocerus telus* DeLong & Hershberger

*Idiocerus telus* DeLong & Hershberger (1947, p. 45).

Fig. 42. Length 5 mm. Resembling *pallidus* in form and appearance, but differing in the male genitalia. White, tinged with green, without dark margins, basal angles of scutellum yellowish. Elytra subhyaline, veins tinted with green. Face pale. Antennal discs large, black, ovate. Male plates elongate, rather narrow. Each style, fig. 67, slightly broadened near apex, then rapidly narrowed, and bearing a prominent spine just before pointed apex; ventral portion of aedeagus tapered from base to apical fifth, which is broadened by a pair of prominent spines that are webbed to the main aedeagus shaft; these spines slope almost to a blunt apex, giving the head portion a triangular appearance; dorsal portion shorter and constricted at middle between a rather broad base and a broader diamond-shaped apex, the last with pointed apical margin, and a broad pointed lateral margin on each side.

**Illinois Record.**—PIKE: June 28, 1934, DeLong & Ross, 2 ♂.

### 9. *Idiocerus scurrus* (Germar)

*Jassus scurra* Germar (1834, pl. 11).

*Jassus crenatus* Germar (1834, pl. 10).

*Idiocerus germari* Fieber (1868, p. 451).

*Idiocerus gemmisimulans* Leonard & Crosby (1915, p. 542).

Fig. 43. Length 6–7 mm. Large, robust, brownish or brownish gray, variously marked with dark brown or black, but without definite spots on vertex. Face pale, usually with a dark, often broken, band on upper portion between eyes. In well-marked specimens the basal angles of the scutellum are black. Veins of elytra alternately yellow and brown, appearing raised and conspicuous. Central claval vein on inner margin of each elytron always yellow at apex. Seventh sternite of female roundedly produced and slightly notched at middle. Male plates narrow and elongate. Each style, fig. 68, somewhat narrowed on apical third, without long apical spine; ventral portion of aedeagus bearing a pair of long spines one-third the distance from apex, not enlarged at apex; dorsal portion of aedeagus tapered toward apex, then constricted, beyond which it is enlarged to form a large rounded apical portion.

This European species, which has been recorded from New York, has been taken from Lombardy poplar.

Illinois Record.—URBANA: Sept. 1-9, 1944, Hasbrouck, 1 ♀.

#### 10. *Idiocerus hebetus* DeLong & Hershberger

*Idiocerus hebetus* DeLong & Hershberger (1947, p. 48).

Fig. 44. Length 6-7 mm. Resembling *lachrymalis* Fitch (1851, p. 58) in form and appearance, but paler in color and with distinctive male genitalia. Face pale, ocelli dark. A broken dark brown band on margin of vertex forming a dark spot next to each eye, and a band produced upward on each end to include a round spot like that on *lachrymalis*. Pronotum cream to dark gray, median anterior portion pale brown. Scutellum white to cream, basal angles brown, a transverse line at middle brown. Each elytron brownish subhyaline, darker on anterior half of clavus and apical portion. Male antennal discs narrow, elongate, black. Male plates elongate and rather narrow. Styles, fig. 66, each rather broad and only slightly tapered to region near apex, then pointed and bearing a prominent spine; ventral portion of aedeagus stout, with a pair of rather long basally directed spines just before apex; dorsal portion of aedeagus broader at base than ventral portion, narrowed, then broadened at apex to form a diamond-shaped tip with a pointed apex, lateral margins sharply angled.

This species can easily be distinguished from *lachrymalis*, a western species which has been confused with it in the past, by the paler, more uniform color, the smaller diamond-shaped terminus of the dorsal aedeagus, and the single instead of double spines at apex of each style. For purposes of comparison, *lachrymalis* is illustrated in figs. 45, 65, 84.

Illinois Records.—GALENA: July 10, 1934, DeLong & Ross, 2 ♂, 3 ♀; June 28, 1935, DeLong & Ross, 1 ♂.

#### 11. *Idiocerus subnitens* Sanders & DeLong

*Idiocerus subnitens* Sanders & DeLong (1917, p. 82).

Fig. 53. Length 6 mm. Resembling *lachrymalis* in coloration but smaller and nar-

rower. Vertex with broad black band between eyes and with round black spot either side above band and not far from eyes. Pronotum with dark markings, especially noticeable at lateral margins. Scutellum with black basal angles, a central Y-shaped black line with the bifurcate portion at apex, and a round black spot at either side on disc; each elytron smoky, nervures brown except for a white transverse band at apex of clavus. Female seventh sternite with posterior margin roundedly produced. Male plates narrow, elongate. Styles, fig. 64, tapered and narrowed on apical third, each bearing two long prominent spines at apex; ventral portion of aedeagus with an elongate rather narrow head portion bearing a pair of rather short spines at base; dorsal aedeagus portion broadened, fanlike at apex, considerably wider than aedeagus shaft, and with a broadly rounded apex.

This species has been taken only in small numbers from poplar in the more northern regions of the eastern United States. It has not been recorded from Illinois but is known to occur in Wisconsin.

#### 12. *Idiocerus ramentosus* (Uhler)

*Bythoscopus ramentosus* Uhler (1877, p. 465). *Idiocerus mimicus* Gillette & Baker (1895, p. 76).

*Idiocerus brunneus* Osborn & Ball (1898, pp. 72, 129).

Fig. 47. Length 4-5 mm. Broad, robust, cinnamon brown in color, with two black spots margined with yellow on vertex; an interrupted line below spots. Face tawny. Pronotum and scutellum brown. Elytra brown, subhyaline, nervures dark brown, tuberculate. Male antennal discs slightly elongate. Female seventh sternite, fig. 85, with posterior margin broadly and roundedly produced. Male plates elongate and narrow. Styles, fig. 69, rather narrow, each broadest at about one-fourth of the distance from apex, which is bluntly pointed and without long spines; ventral aedeagus slightly enlarged at apex, with a pair of long spines at base of enlargement and not far from apex; dorsal aedeagus rounded at base, narrowed to a slender shaft, which is not enlarged at apex.

This is one of the willow species occurring in the Mississippi River valley and westward to Colorado.

Illinois Records.—Males and females, taken May 6 to October 1, are from Alton,

Byron, Elizabethtown, Fulton, Grafton, Havana, Homer, Kampsville, Lima, Meredosia, Pike, Putnam, Quincy, Rock Island, Savanna, Seymour, and Topeka.

### 13. *Idiocerus crataegi* Van Duzee

*Idiocerus crataegi* Van Duzee (1890b, p. 110).

Fig. 48. Length 4.75–5.25 mm. Gray, with a pair of black spots on anterior margin of vertex, on pronotum, and on scutellum, these three pairs of spots arranged in two longitudinal rows; in addition, a pair of small approximate spots on disc of scutellum, a pair beneath ocelli, and a more elongate pair beneath the antennae. Elytra greenish brown; nervures dark. Female seventh sternite almost triangular, apex slightly and angularly notched. Male plates narrow and elongate. Each style, fig. 70, uniform in width on apical two-thirds and blunt at apex; ventral portion of aedeagus slender, scarcely enlarged at apex and bearing a pair of prominent spines near apex; dorsal aedeagus process broadened to about twice its width at apex; lateral portions angled and sharply pointed and apex pointed.

Recorded from Iowa, Missouri, and Colorado, *crataegi* is one of the common species on various types of *Crataegus*.

**Illinois Records.**—MONTICELLO: Sept. 22, 1934, Ross, 2 ♀. URBANA: July 9, 1920, 1 ♀; Sept. 6, 1934, DeLong and Ross, 2 ♂, 10 ♀.

### 14. *Idiocerus provancheri* Van Duzee

*Bythoscopus clitellarius* Provancher (1890, p. 288). Name preoccupied.

*Idiocerus provancheri* Van Duzee (1890b, p. 111). New name.

Fig. 49. Length 5.0–5.3 mm. Fulvous brown in color, with a broad yellow stripe on clavus. Vertex with two large black spots. Pronotum with pale spots only. Scutellum rufus. Costal margin of each elytron with hyaline spot before tip, a distinct bright yellow area from basal outer claval margin to just before apex of outer claval nervure. Female seventh sternite, fig. 86, rather strongly and roundedly produced on posterior margin. Male plates elongate and narrow. Styles, fig. 73, strongly curved on apical third and each tapered to pointed apex; ventral portion of aedeagus constricted about one-third the distance from the apex and then slightly enlarged and blunt at apex;

ventral aedeagus enlarged at apex to form a broad fanlike structure, which is broadly and convexly rounded on apical margin.

Like *crataegi*, *provancheri* is common on *Crataegus* throughout the eastern United States.

**Illinois Record.**—MONTICELLO: June 11, 1934, Frison & DeLong, 3 ♂, 2 ♀.

### 15. *Idiocerus fitchi* Van Duzee

*Idiocerus maculipennis* Fitch (1851, p. 59). Name preoccupied.

*Idiocerus fitchi* Van Duzee (1909b, p. 383). New name.

Fig. 50. Length 5.25–5.75 mm. Brown, with narrow stripes on pronotum, scutellum, and clavus. Vertex with a pair of large black spots surrounded by broad yellow circles. Small crescents under the ocelli light yellow. Pronotum with a pair of black spots on the anterior margin; three spots on disc and posterior margin yellow. Scutellum with apex and margins pale yellow. Elytra brown, nervures darker, each elytron with a narrow light stripe on outer margin of clavus; costal margin broad and dark, interrupted by a hyaline band that crosses the apex and broadens on costa. Each antenna simple. Female seventh sternite, fig. 89, with posterior margin broadly and roundedly produced. Male plates elongate and narrow. Styles, fig. 76, together lyrate in shape, narrowed on apical halves, curved outwardly and gradually narrowed to pointed apices; ventral aedeagus narrowed on middle half, apical portion clublike and rounded at apex.

An abundant species on *Crataegus* and often found on cultivated varieties of apple, *fitchi* occurs in the eastern United States and west to Iowa.

**Illinois Records.**—LUDLOW: Aug. 19, 1914, 1 ♀. MONTICELLO: June 11, 1934, Frison & DeLong, 4 ♂, 7 ♀. MUNCIE: July 5, 1914, 1 ♀. PROPHETSTOWN: July 7, 1925, T. H. Frison, 1 ♀. SHAWNEETOWN: June 14, 1934, Ross & DeLong, 1 ♂. URBANA: June 29, 1891, Hart & McElfresh, 1 ♂; July 5, 1891, Shiga, 1 ♂; June 23, 1892, Summers, 1 ♀; June 24, 1892, McElfresh, 1 ♂; June 25, 1892, 1 ♀; June 28, 1892, McElfresh, 1 ♀; Aug. 19, 1892, Hart, 2 ♀; Sept. 17, 1892, 1 ♀; July 9, 1920, 4 ♀; July 26, 1920, 1 ♀; Sept. 6, 1934, DeLong & Ross, 3 ♀. WHITE HEATH: July 5, 1916, 1 ♂, 2 ♀.

**16. *Idiocerus snowi* Gillette & Baker**

*Idiocerus snowi* Gillette & Baker (1895, p. 79).

Fig. 55. Length 5.25–5.75. Pale green, with two small round black spots on vertex and elytra, suture black. Face yellow, pronotum and scutellum unmarked. Elytra yellowish green, each with a dark brown stripe along the sutural margin from the apex of scutellum to the apex of clavus. Male antennae simple and without discs. Female seventh sternite, fig. 88, with posterior border convexly rounded, shallowly emarginate on median half. Male plates elongate and narrow. Each style, fig. 71, broad, apical fifth gradually narrowed to bluntly pointed apex, without long spines at apex; ventral aedeagus broad at base, narrowed and produced to form a long slender apical portion, with lateral spines almost half way from apex to base; dorsal process of aedeagus broad from base to apex and broadened on apical third to form a pointed lateral margin on each side; apical margin broad, slightly produced at middle and broadly pointed.

This species occurs on narrow-leaved willows and is common in the middle western states.

**Illinois Records.**—Many males and females, taken June 13 to September 27, are from Algonquin, Alton, Alto Pass, Apple River Canyon State Park, Arcola, Beardstown, Byron, Champaign, Chemung, Danville, Decatur, Des Plaines, Eichorn, Elizabethtown, Fox Lake, Fulton, Grafton, Grand Tower, Havana, Kampsville, Kankakee, Lawrenceville, Mason City, Mokense, Neoga, Niota, Normal, Oak Lawn, Ogden, Oquawka, Ottawa, Pike, Princeton, Prophetstown, Putnam, Rock Island, St. Anne, Savanna, Seymour, Shawneetown, Starved Rock State Park, Topeka, Urbana, and Waukegan.

**17. *Idiocerus rotundens* DeLong & Caldwell**

*Idiocerus rotundens* DeLong & Caldwell (1937, p. 162).

Fig. 52. Length 4.5–6.0 mm. Pale yellow, with black ocelli. Vertex with a round median dusky area and a round black spot on either side. Scutellum marked only by black spots at base. Elytra white, veins to apical crossveins white, brownish beyond apical crossveins. Each antenna with large

circular terminal black disc. Female seventh sternite almost truncate on posterior margin, slightly produced, broadly rounded. Male plates narrow and elongate. Each style, fig. 74, slightly and gradually narrowed to pointed apex, bearing a single long spine; ventral aedeagus slender to apex, bearing a pair of prominent spines about one-fourth the distance from apex; dorsal portion of aedeagus enlarged at apex to form a rather broad process, the lateral margins of which are pointed, the posterior margin gradually sloping to the median two-thirds, which is truncate apically.

This is one of the small species occurring on willow. It has previously been recorded in the literature only from Wisconsin.

**Illinois Records.**—Many males and females, taken May 6 to October 31, are from Algonquin, Antioch, Ashley, Byron, Centerville, Champaign, Crescent City, Danville, Fox Lake, Freeport, Fulton, Grafton, Grand Tower, Grays Lake, Havana, Homer, Kampsville, Kankakee, Meredosia, Metropolis, New Holland, Niota, Oak Lawn, Oregon, Pike, Princeton, Putnam, Quincy, Rock Island, Seymour, Spring Grove, Waukegan, and Vienna.

**18. *Idiocerus varius* DeLong & Hershberger**

*Idiocerus varius* DeLong & Hershberger (1947, p. 46).

Fig. 46. Length 5.0–5.5 mm. Resembling *alternatus* in general coloration and appearance, but with distinctive male genitalia and large antennal discs. Face marked as in *alternatus*, with a large median dark area on upper portion extending across vertex. Vertex marked with an elongate brown spot next to each eye and a large round black spot not far from each eye just above margin. Pronotum brown, with heavy dark markings. Scutellum pale brown, with black spots in basal angles and a series of small connected black spots across middle. Elytra pale brownish subhyaline, veins dark brown, interrupted by white veins at the middle of each clavus and across elytron at apex of clavus. Male antennal discs broad, ovate, and black.

Female seventh sternite, fig. 87, slightly and roundedly produced posteriorly. Male plates elongate and narrow. Each style, fig. 77, long and slender and with a spine near apex; ventral portion of aedeagus rather

broad at base and tapered to form a rather narrowed head with a barblike spine either side about one-fourth the distance from apex; dorsal portion of aedeagus broad at base, constricted on median portion and narrow to apex, which is broadened to the width of the projecting spines on ventral portion; apex convexly rounded.

**Illinois Records.**—Many males and females, taken June 14 to July 16, are from Algonquin, Apple River Canyon State Park, Geff, Golconda, Grand Detour (Castle Rock), Karnak, Rock Island, Shawneetown, and Vienna.

#### 19. *Idiocerus apache* var. *juniperus*

DeLong & Hershberger

*Idiocerus apache* var. *juniperus* DeLong & Hershberger (1947, p. 46).

Fig. 54. Length 4.5–5.0 mm. Resembling *alternatus* in form and general appearance, but with larger antennal discs and distinctive genitalia. Face pale, lorae and genae with heavy brown longitudinal stripes. Upper portion of face with a large median dark area that extends across vertex as in *alternatus*. Vertex pale brown, with a round black spot on each side not far from eye and just above margin. Pronotum pale brown, tinted with gray and with dark brown markings on anterior portion. Scutellum cream to pale brown, black spots in basal angles and a broad longitudinal white stripe on apical half. Elytra brownish subhyaline, veins dark brown, interrupted by white portions at middle of each clavus and apex of clavus. Male antennal discs black, elongate, ovate. Female seventh sternite, fig. 90, scarcely produced posteriorly, almost truncate. Male plates elongate, rather narrow. Styles, fig. 75, tapered, apical half of each rather slender, bearing a pair of spines near apex on dorsal portion; ventral portion of aedeagus rather straight and slender, with a pair of short barblike spines a short distance from apex; dorsal portion of aedeagus broadened gradually, then abruptly to form a broad apex, which is slightly trilobate on apical margin and has broad but pointed lateral processes.

The typical *apache* Ball & Parker (1946, p. 76) is a western form, occurring in Arizona, Utah, and California.

**Illinois Records.**—**GOLCONDA:** June 22, 1932, Ross, Dozier, & Park, 1♀, 2♂. **HORSESHOE LAKE:** July 11, 1935, DeLong

& Ross, 1♂. **KAMPSVILLE:** June 27, 1934, DeLong & Ross, 1♂, 3♀. **MAHOMET:** April 30, 1936, Frison & Ross, 1♂. **URBANA:** April 6, 1900, 1♂.

#### 20. *Idiocerus alternatus* Fitch

*Idiocerus alternatus* Fitch (1851, p. 59).

*Idiocerus interruptus* Gillette & Baker (1895, p. 74).

Fig. 56. Length 5.0–5.25 mm. Brownish fuscous, marked with white on pronotum and elytra. Vertex usually marked with a brownish crescent outside the round spots. A light stripe on the middle of pronotum extending on to vertex and back across the scutellum. Basal angles and two spots on disc of scutellum black. Elytra subhyaline, nervures fuscous, interrupted with white, a large circular light spot covering the tips of the outer claval nervures and a smaller one at apex of each clavus. Male antennal discs black, slightly enlarged. Female seventh sternite slightly produced, almost truncate, slightly notched at middle. Male plates elongate and narrow; styles, fig. 72, gradually tapered to narrow pointed apices, each of which bears a pair of long spines; ventral aedeagus narrow and bearing a small short headlike structure at the base of which is a pair of short barblike spines; dorsal process of aedeagus abruptly broadened to form a transverse apical process, each lateral margin of which is sharp pointed; the apical margin curves convexly between the pointed lateral margins.

Transcontinental in distribution, this is one of the most abundant species occurring on willow.

**Illinois Records.**—**APPLE RIVER CANYON STATE PARK:** Aug. 22, 1935, DeLong & Ross, 1♀; July 16, 1936, Mohr, 2♂, 1♀. **GEFF:** June 12, 1934, DeLong & Ross, 1♂, 2♀. **GRAND DETOUR:** Castle Rock, July 12, 1934, DeLong & Mohr, 1♂. **HAVANA:** July 2, 1934, DeLong & Mohr, 2♂; Aug. 30, 1917, 1♂. **ST. JOSEPH:** May 10, 1914, 1♂. **URBANA:** April 4, 1889, Marten, 2♂; April 4, 1908, 3♂, 1♀.

#### 21. *Idiocerus moniliferus* Osborn & Ball

*Idiocerus moniliferus* Osborn & Ball (1898, pp. 71, 131).

Fig. 51. Length 5.5 mm. Resembling *alternatus* in coloration but a little larger,

more robust, and more distinctly marked. Margin of vertex marked with a broad transverse band between ocelli and spots on vertex. Front broad, a brown band on either side just inside anterior margin extending across just below the antennal pits. Elytra subhyaline, nervures alternately light and dark, bases of all nervures light, the cross nervures between the sectors broadly light. Each antenna simple and without disc. Female seventh sternite, fig. 91, rather strongly and roundedly produced. Male plates long and slender. Each style, fig. 78, especially broadened on apical half, apex pointed; ventral portion of aedeagus slender and produced apically; dorsal portion slightly and abruptly broadened near apex, forming an apical triangular head, the apex of which is bluntly pointed.

This species has previously been recorded from Iowa and Kansas.

**Illinois Records.**—KARNAK: June 23, 1932, Ross, Dozier, & Park, 1 ♀. LITCHFIELD: May 10, 1932, Ross & Mohr, 1 ♂. LUTHER: dry marsh, July 2, 1934, DeLong & Ross, 1 ♀. OAKWOOD: May 15, 1926, Auden, 1 ♀. URBANA: Aug. 6, 1890, at light, Hart & Shiga, 1 ♂.

### Subfamily MACROPSINAE

The vertex is short but is obtusely angled anteriorly. The hind wing has three apical cells.

Two genera belong to this subfamily, *Macropsis* and *Oncopsis*, both of which occur in Illinois.

#### KEY TO GENERA

- Ocelli about midway between eyes and meson, fig. 93. 2. *Macropsis*  
Ocelli about twice as far from meson as from eyes, fig. 92. 3. *Oncopsis*

### 2. *MACROPSIS* Lewis

*Macropsis* Lewis (1835, p. 49).

*Pediopsis* Burmeister (1838, pl. 10).

Figs. 26, 93, 94. Head almost or entirely deflexed, as wide as pronotum; vertex almost parallel margined, obtusely angulate. Lorae of female prominent, tumid; those of male often reduced and nearly obscured by the swollen and bulging clypeus. Pronotum distinctly angled anteriorly, produced beyond the anterior margins of the eyes; lateral margins very short, posterior margin

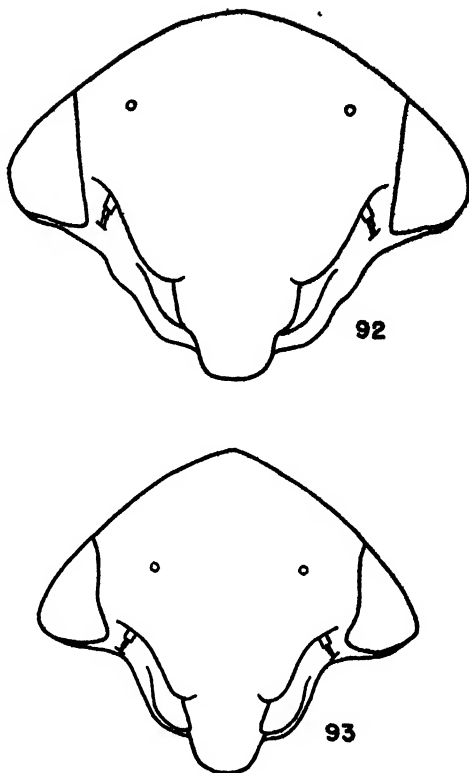


Fig. 92.—*Oncopsis viridis* ♀, face.

Fig. 93.—*Macropsis basalis* ♀, face.

usually broadly concave and in some species somewhat angulate; striae or rugae radiating from a central line obliquely toward the posterior angles. Elytra without appendixes.

These species occur for the most part upon willow, poplar, honey locust, and wild plum, and are frequently found in association with species of *Idiocerus*, which are found on at least two of the same trees or shrubs. The genus, which is distributed throughout the United States and Canada, contains nearly 40 species and varieties, of which 17 have been taken in Illinois. Two others may occur here.

The following key to species is condensed largely from that of Breakey (1932).

#### KEY TO SPECIES

1. Green in color; each hind tibia usually bearing a prominent black spot near the base; a black spot at apex of vertex. . . . . 1. *viridescens* var. *gambeliana*  
Hind tibiae without black spots. . . . . 2
2. Elytra of a uniform color (color of underlying body must not be considered). . . . . 3  
Elytra not of the same color or shade throughout. . . . . 11

3. Elytra green or greenish hyaline, sometimes slightly smoky. . . . . 4  
Elytra amber to smoky amber. . . . . 14
  4. Prothoracic epimeron bearing a distinct black spot behind the eye. . . . . 5  
Prothoracic epimeron unmarked. . . . . 8
  5. Female. . . . . 2. *erythrocephala*  
Male. . . . . 6
  6. Extremities of tibiae banded with black. . . . . 7  
Extremities of tibiae not banded with black (western). . . . . 2. *erythrocephala*
  7. Length 5 mm., face not marked with black. . . . . 3. *trivialis*  
Length 4 mm., face with definite black markings. . . . . 4. *reversalis*
  8. Females. . . . . 9  
Males. . . . . 13
  9. More than 5 mm. in length. . . . . 10  
Not exceeding 5 mm. in length. . . . . 12
  10. Body concolorous with elytra. . . . . 11  
Head and thorax reddish brown, elytra pale green. . . . . 5. *rufoccephala*
  11. Robust in form; clypeus tumid, keystone shaped. . . . . 6. *viridis*  
More slender in form; clypeus not so tumid, lateral margins more nearly parallel. . . . . 3. *trivialis*
  12. Clypeus nearly parallel margined; elytra smoky, especially on the clavus. . . . . 15. *fumipennis* var. *gleditschiae*  
Clypeus definitely keystone shaped; elytra faintly smoky apically. . . . . 7. *confusa*
  13. Robust in form; face long; smokiness of elytra concentrated on claval areas. . . . . 15. *fumipennis* var. *gleditschiae*  
Slender; face short; smokiness of elytra wanting or limited to apical areas. . . . . 7. *confusa*
  14. Vertex and pronotum green to yellowish green, not spotted; abdomen fulvous. . . . . 6. *viridis*  
Vertex, pronotum, and abdomen otherwise. . . . . 15
  15. Anterior impressions concolorous with pronotum. . . . . 8. *basalis*  
Anterior impressions darkly maculate with fuscous. . . . . 16
  16. Pronotum obtusely angled anteriorly; lateral margins of clypeus bulging out over the lorae. . . . . 9. *bifasciata*  
Pronotum right angled anteriorly; lateral margins of clypeus nearly parallel, distinct. . . . . 2. *erythrocephala*
  17. Face with conspicuous impressed black points or spotted with black. . . . . 10. *tristis*  
Face without points or spots, sometimes suffused with fuscous. . . . . 18
  18. Elytra hyaline with well-defined and nearly continuous transverse fuscous bands. . . . . 19  
Elytra otherwise. . . . . 22
  19. Bases of elytra heavily banded with deep brownish fuscous. . . . . 20  
Bases of elytra free of brownish or fuscous bands. . . . . 21
  20. Head and thorax concolorous with rest of body. . . . . 12. *osborni*  
Head and thorax reddish brown above in contrast with greenish body. . . . . 8. *basalis*
  21. Elytra narrowly twice banded with fuscous, anterior band oblique, interrupted at claval suture. . . . . 9. *bifasciata*  
Elytra broadly twice banded with fuscous, anterior band transverse, not interrupted at claval suture. . . . . 11. *canadensis*
  22. Elytra marked with black or deep fuscous in the form of patterns or definite areas. . . . . 23  
Elytra deep brownish opaque, marked with a transverse hyaline band or pellucid white spots. . . . . 24
  23. Clavus black; corium of female green, corium of male smoky amber. . . . . 13. *suturalis*  
Black or fuscous color of elytra extending to near costa, costa green or greenish hyaline. . . . . 14. *fumipennis*
  24. Elytra deep brownish opaque, a transverse band before the apex. . . . . 25  
Elytra brownish opaque, unmarked, or marked with round pellucid white spots. . . . . 26
  25. Elytra uniform ferruginous brown, hyaline band narrow. . . . . 16. *ferruginoides*  
Elytra blackish, hyaline band usually indefinite; black in base of each elytron often confined to corium and concentrated along costa. . . . . 17. *nigricans*
  26. Brownish, one pellucid white spot on each corium of female and sometimes of male; clavus concolorous with corium. . . . . 18. *insignis*  
Blackish brown, three pellucid white spots on each corium; clavus cinereous. . . . . 19. *trimaculata*
1. *Macropsis virescens* var. *graminea* (Fabricius)
- Cicada graminea* Fabricius (1798, p. 521).
- Length of female 5.0 mm., male 4.4 mm. Slender, green, with vertex rather sharply pointed. Each hind tibia of both sexes bears a conspicuous black spot on the outside near the base. The face appears almost flat as viewed from the sides. The female is yellowish green, with a black spot at apex of vertex. The male is frequently infuscated above. Elytra greenish hyaline with apex smoky and veins green. Basal angles of scutellum in both sexes usually infuscated. Epimera marked with black spots.
- This variety of the species *virescens* Gmelin (1790, p. 2111) has been collected from the poplar, *Populus nigra*. It has been recorded from the eastern states and as far west as Wisconsin and Illinois.
- Illinois Records.—ALDRIDGE: May 8, 1932, Dozier, 3♂, 1♀. DUBOIS: May 24, 1917, 1♀. ELIZABETHTOWN: May 27-31, 1932, Dozier, 3♂, 3♀. GRAND TOWER: May 12, 1932, Frison, Ross, & Mohr, 1♂. KAMPSVILLE: June 27, 1934. DeLong &

ROSS, 1 ♀. MOUND CITY: May 24, 1932, Dozier, 1 ♀. ROUND LAKE: June 27, 1936, Frison & DeLong, 25 ♂, 63 ♀. ULLIN: May 26, 1932, Dozier, 1 ♀.

## 2. *Macropsis erythrocephala* (Gillette & Baker)

*Pediopsis erythrocephala* Gillette & Baker (1895, p. 72).

Length of female 6 mm., male 5 mm. Dimorphic color. Female green, slightly tinted with fulvous anteriorly. Elytra pale greenish hyaline. Male brown to brownish green, heavily marked with fuscous. Face and area beneath fuscous, pronotum and scutellum brown, the basal angles of scutellum with black triangular spots. Elytra fuscous hyaline, veins darker. A large black spot on each epimeron in both sexes. Face distinctly concave as viewed from the side.

Commonly found on willow, *Salix longifolia*, this species has been collected from coast to coast, and is especially numerous in the northern states.

**Illinois Records.**—Many males and females, taken June 12 to August 24, are from Alton, Beardstown, Byron, Cache, Carbondale, Decatur, Eichorn, Elizabethtown, Fox Lake, Freeport, Galena, Geff, Grafton, Grand Detour, Grand Tower, Havana, Kampsville, Kankakee, Marshall, New Milford, Newton, Oquawka, Oregon, Palos Park, Pike, Prophetstown, Putnam, Savanna, Spring Grove, Spring Valley, Urbana, Vienna, Waukegan, and West Union.

## 3. *Macropsis trivialis* (Ball)

*Pediopsis trivialis* Ball (1902b, p. 304).

Length of female 5.5 mm., male 4.5 mm. More slender in form than *viridis*. Female yellowish green, unmarked, elytra greenish hyaline with concolorous veins. Male with black spots on the epimera, extremities of the fore and middle tibiae, and tarsal claws; elytra greenish hyaline, somewhat smoky toward the apexes. In both sexes the second apical cell is usually more than half the length of the middle anteapical cell.

Taken from willow, *Salix amygdaloides*, this species is known to occur in the eastern United States and as far west as Colorado.

**Illinois Records.**—ELIZABETH: July 8, 1917, 1 ♀. FREEPORT: July 2, 1917, 1 ♂, 3 ♀. GALENA: July 5, 1917, 1 ♂. GEFF: June 12, 1934, DeLong & Ross, 1 ♀. HOMER:

June 4, 1916, 1 ♀. MONTICELLO: June 11, 1934, Frison & DeLong, 1 ♂, 3 ♀. PUTNAM: July 6, 1934, Ross & DeLong, 6 ♀. URBANA: June 19, 1889, Hart, 1 ♀; June 28, 1892, McElfresh, 1 ♂. WHITE HEATH: July 5, 1916, 1 ♀.

## 4. *Macropsis reversalis* (Osborn & Ball)

*Pediopsis reversalis* Osborn & Ball (1898, pp. 69, 123).

Length of female 4.5 mm., male 4.0 mm. Small and greenish. The female is unmarked, while the male has on the face two broad black bands, sometimes broken into spots, and black spots on the epimera and extremities of the legs. In some individuals the bands on the face are reduced to three spots, one on the apex above, and one just within and below each ocellus. Face somewhat tumid as viewed from the side. Elytra greenish hyaline.

This species has been taken from *Salix* spp. in the eastern United States.

**Illinois Records.**—Males and females, taken May 29 to July 16, are from Apple River Canyon State Park, Fulton, Galena, Grafton, Grand Detour, Havana, Herod, Lacon, Meredosia, Oquawka, Oregon, Pike, Putnam, Rock Island, and Urbana.

## 5. *Macropsis rufoccephala* Osborn

*Macropsis scutellatus* Osborn (1928, p. 218). Name preoccupied.

*Macropsis rufoccephala* Osborn (1932, p. 513). New name.

Length of female 5.5 mm. Yellowish green. Female with vertex, pronotum, anterior two-thirds of scutellum, and upper half of face reddish brown. Scutellum with black spots in basal angles, apical angle yellowish green. Elytra pale greenish hyaline, veins green. Epimera unmarked. Face appearing concave below vertex as viewed from the side. No male has been collected.

This is a transcontinental species and has been collected from willow, *Salix* spp.

**Illinois Records.**—FREEPORT: July 2, 1917, 1 ♀; July 4, 1917, 1 ♀. HOMER: June 14, 1916, 1 ♀.

## 6. *Macropsis viridis* (Fitch)

*Pediopsis viridis* Fitch (1851, p. 59).

Length of female 5.5 mm., male 4.5 mm. Robust, yellowish green. Female unmarked,



elytra greenish hyaline, veins green. Male elytra amber-brown, veins concolorous; each epimeron bears a broad black mark and abdomen is fulvous above. In both sexes face appears almost flat as viewed from the side. Elytra each with the second apical cell scarcely more than half as long as the middle anteapical cell.

This is a widely distributed northern transcontinental species that has been reported feeding upon willow, *Salix longifolia*.

**Illinois Records.**—Many males and females, taken May 12 to August 8, are from Algonquin, Apple River Canyon State Park, Alton, Champaign, Danville, Decatur, Eichhorn, Elizabethtown, Fox Lake, Freeport, Fulton, Galena, Geff, Grafton, Grand Detour, Grand Tower, Grays Lake, Hardin, Havana, Herod, Iroquois, Kampsville, Lacon, Marshall, Meredosia, Monticello, New Holland, Newton, Oquawka, Oregon, Pike, Princeton, Putnam, Quincy, Round Lake, Savanna, Shawneetown, Spring Valley, Temple Hill, Urbana, Vienna, Wauconda, West Union, White Heath, and Zion.

### 7. *Macropsis confusa* Breakey

*Macropsis confusa* Breakey (1932, p. 827).

Length of female 4.75 mm., male 4.0 mm. Pale green, resembling *viridis* but smaller; without definite markings. Elytra faintly smoky. Face appearing distinctly tumid as viewed from the side. Epimera in both sexes without spots.

The species is known to occur on poplar, *Populus* spp., and has been taken in the northeastern states and in Wisconsin, as well as Illinois.

**Illinois Records.**—ANTIOCH: June 12, 1926, Ross & Burks, 16♂, 3♀; Aug. 1, 1930, Frison, Knight, & Ross, 1♀. DUBOIS: May 24, 1917, 1♂, 1♀. ELIZABETHTOWN: May 21–31, 1931, Dozier, 1♂. GALENA: June 28, 1935, DeLong & Ross, 15♀. HARDIN: June 5–9, 1932, Dozier, 1♀. KAMPVILLE: June 27, 1934, DeLong & Ross, 1♀. NEW HOLLAND: June 5, 1936, Mohr & Burks, 1♂. SAVANNA: July 27, 1892, McElfresh, Shiga, Hart, & Forbes, 1♂.

### 8. *Macropsis basalis* (Van Duzee)

*Pediopsis basalis* Van Duzee (1889b, p. 171).

Length of female 5.0 mm., male 4.0–4.25 mm. Robust, dark transverse bands on the

elytra. Epimera unmarked in the female, with black spots in the male. Female olive green; pronotum, scutellum, and upper portion of face ferruginous; elytra greenish hyaline, a broad black band on the base of each clavus and two other transverse bands sometimes fused. Male smoky ferruginous; elytra dark amber, with black basal bands as in female, vertex, pronotum, and scutellum with brown punctures; brown triangular spots in basal angles of scutellum.

This species, northern in range, occurs upon quaking aspen, *Populus tremuloides*.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: June 29, 1935, DeLong & Ross, 7♂, 33♀. GALENA: on aspen, July 10, 1934, DeLong & Ross, 3♂, 6♀; June 28, 1935, DeLong & Ross, 20♂, 19♀. GRAFTON: along river, June 26, 1934, DeLong & Ross, 1♀. SPRING GROVE: June 8, 1938, Burks & Mohr, 1♀. WARREN: June 29, 1935, DeLong & Ross, 2♂, 5♀.

### 9. *Macropsis bifasciata* (Van Duzee)

*Pediopsis bifasciata* Van Duzee (1889b, p. 173).

Length of female 5.25 mm., male 5.0 mm. Dull greenish ferruginous, marked by two dark transverse cross bands. Pronotum washed with fuscous on disc. Face pale yellow. Basal angles of scutellum with black triangular spots. Female with elytra grayish hyaline, an oblique transverse band across middle of each, interrupted at claval suture, and another transverse band just below the apex; veins concolorous. Male with elytra fuscous hyaline, without bands. Epimera of both sexes with large black spots.

This species has been collected from poplar, *Populus* spp., and ranges from the eastern United States to Colorado.

**Illinois Records.**—GALENA: July 10, 1934, DeLong & Ross, 2♀; June 28, 1935, DeLong & Ross, 1♀.

### 10. *Macropsis tristis* (Van Duzee)

*Pediopsis tristis* Van Duzee (1890b, p. 249).

Length of female 5.5 mm., male 4.75 mm. Cinereous brown, pale beneath. Pronotum and scutellum cinereous. Basal angles of scutellum with black triangular spots. Face with black band above and large circular black spot below. Elytra cinereous hyaline, veins lighter, narrowly margined with fuscous. Epimera slightly fuscous.

This species ranges from the East to the Middle West and is known to occur on wild plum, *Prunus* spp.

Illinois Record.—NORTHERN ILLINOIS: June, Peabody Collection, 2♀.

#### 11. *Macropsis canadensis* (Van Duzee)

*Pediopsis canadensis* Van Duzee (1890b, p. 111).

Length of female 5.25 mm., male 4.75 mm. Varying from pale yellowish green to pale fulvous, the elytra with two brown bands. Pronotum obtusely angled, moderately convex; elytra long, rather narrow, broadly rounded at apex.

Female head and thorax yellowish green or greenish fulvous, immaculate, epimera unmarked; elytra greenish hyaline, each with two brownish fulvous bands, the first near the middle and the second just before the apex. Male darker, fulvous or tawny, each epimeron bearing a large black spot; lower part of face and area beneath paler; scutellum cinereous, a brown triangle within each basal angle, a narrow red line down the center to the transverse impression, which is also reddened, elytra banded as in female.

This species is widely distributed from Maine to California. It should be found in northern Illinois.

#### 12. *Macropsis osborni* Breakey

*Macropsis osborni* Breakey (1932, p. 817).

Length of female 6 mm., male 5 mm. Superficially resembling *basalis*, especially in having a dark band across base of elytra. Face appears tumid as viewed from the side. Female yellowish green, elytra greenish hyaline, with a cupreous tint, a broad black band confined to the bases of the claval areas bordering scutellum; epimera without spots. Male green, washed with fuscous; elytra cinereous hyaline, tinged with fulvous, a broad black band on bases of elytra as in female; basal angles of scutellum with large triangular spots; epimera with black spots.

This species has been taken only in the middle western states, where it occurs in small numbers on cottonwood, *Populus deltoides*.

Illinois Records.—KAMPSVILLE: June 27, 1934, DeLong & Ross, 1♀. PIKE: June 28, 1934, DeLong & Ross, 1♀. SHAWNEETOWN: June 14, 1934, Ross & DeLong, 3♀.

#### 13. *Macropsis suturalis* (Osborn & Ball)

*Pediopsis suturalis* Osborn & Ball (1898, pp. 67, 119).

Length of female 5.5 mm., male 5.0 mm. Female green, with entire clavus black. Male sordid green, elytron smoky so that the black clavus is less conspicuous than in female; scutellum sordid green on the disc, each basal angle marked with a black triangle; pronotum and vertex marked with fuscous; epimera each bearing a black dash.

This species has been reported as occurring on willow, *Salix amygdaloides*. It is known to occur in Iowa, Kansas, Minnesota, Wisconsin, Ohio, Pennsylvania, and Maine, and it probably occurs in Illinois.

#### 14. *Macropsis fumipennis* (Gillette & Baker)

*Pediopsis fumipennis* Gillette & Baker (1895 p. 73)

*Pediopsis crocea* Osborn & Ball (1898, pp. 68, 120).

Length of female 4.75 mm., male 4.0–4.25 mm. Green, heavily tinged with smoky brown. Pronotum yellowish green, disc fuscous. Basal angles of scutellum each with black triangular spots and with two large round impressed green or yellow spots just before the anterior impression. Elytra black or dark brown opaque, costal margins green or yellowish. Epimera without spots.

This species has been taken from honey locust, *Gleditsia triacanthos*, and is recorded from Montana, Colorado, Kentucky, and Ohio, as well as Illinois.

Illinois Records.—ELIZABETHTOWN: May 27–31, 1931, Dozier, 1♂. HAVANA: June 14, 1934, DeLong & Ross, 1♂. IROQUOIS: June 5, 1932, Frison & Mohr, 2♂. MONTICELLO: June 11, 1934, Frison & DeLong, 1♂. MUNCIE: June 8, 1917, 1♂. ST. ANNE: July 20, 1934, DeLong & Ross, 1♀. SHAWNEETOWN: June 27, 1936, DeLong & Mohr, 2♀. URBANA: June 19, 1889, Hart, 1♂. VOLO: in bog, June 11, 1936, Ross & Burks, 1♂.

#### 15. *Macropsis fumipennis* var. *gleditschiae* (Osborn & Ball)

*Pediopsis gleditschiae* Osborn & Ball (1898, pp. 67, 122).

Length of female 4.75 mm., male 4.0–4.25 mm. Lighter in color than typical *fumipennis*. Female bright green, tinted with fuscous.

cous, apexes of elytra hyaline. Male green, elytra brownish or fuscous. Darker specimens often have pronotum and scutellum clouded. Epimera unmarked in both sexes.

Occurring on honey locust, *Gleditsia triacanthos*, this variety ranges from Pennsylvania to Louisiana and Idaho.

**Illinois Records.**—CHAMPAIGN: June 5, 1889, Hart, 1♂. DONGOLA: on willow, May 13, 1916, 1♂. DUBOIS: May 23, 1917, 1♂; May 24, 1917, 2♂. MEREDOSIA: May 29, 1917, 3♂. URBANA: June 17, 1890, Marten, 1♂. WHITE HEATH: May 30, 1915, 1♂.

**16. *Macropsis ferruginoides* (Van Duzee)**

*Pediopsis ferruginoides* Van Duzee (1889b, p. 171).

Length of female 5.5–6.0 mm., male 5.0 mm. Marked with ferruginous above and yellow below. Pronotum darker on disc. Scutellum often with basal angles, apex, and two discal spots yellow. Elytra ferruginous, opaque; costa with a narrow yellow margin. A transverse hyaline band before apex across the crossveins of the anteapical cells. Epimera of both sexes with black spots. Face concave above as viewed from the side.

This species has been taken from a narrow-leaved willow. It is chiefly middle

western, but ranges as far west as Colorado and New Mexico.

**Illinois Record.**—WAUKEGAN: Aug. 24, 1917, 1♀.

**17. *Macropsis nigricans* (Van Duzee)**

*Pediopsis trimaculata* Van Duzee (1889b, p. 172). Preoccupied.

*Pediopsis bifasciata* Van Duzee in Osborn & Ball (1898, p. 118). Misidentification.

*Macropsis nigricans* Van Duzee (1916, p. 64). New name.

Length of female 5.5 mm., male 5.0 mm. Greenish brown, with black markings. Pronotum washed with fuscous, anterior impression usually brown or black. Scutellum greenish fulvous, with dark spots in basal angles. Each elytron hyaline, brown and black pigment on basal half variable, usually darker along costa and with spot at apex of clavus. Epimera with heavy black spots.

Known to occur on cottonwood, *Populus deltoides*, this species apparently is found only in the middle western region of the United States.

**Illinois Records.**—FREEPORT: July 2, 1917, 1♀. GRAFTON: June 26, 1934, DeLong & Ross, 3♀. GRAYS LAKE: June 10, 1936, Ross & Burks, 3♂, 4♀. KAMPSVILLE: June 27, 1934, DeLong & Ross, 1♀. PALOS PARK: June 19, 1933, Ross & Mohr, 1♀. PIKE: June 28, 1934, DeLong & Ross, 6♀.

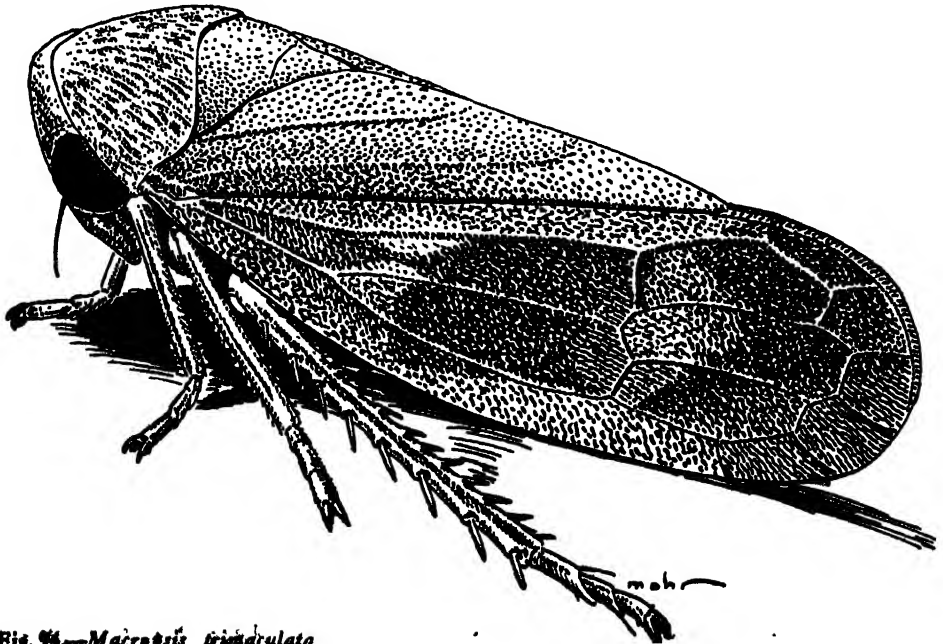


Fig. 94.—*Macropsis trimaculata*.

18. *Macropsis insignis* (Van Duzee)

*Pediopsis insignis* Van Duzee (1889b, p. 171).

Length of female 5.0 mm., male 4.25 mm. Reddish brown, similar to and often confused with *trimaculata*. Pruinose when freshly collected. Pronotum ochraceous, disc dusky to the humeral angles. Scutellum ochraceous, a fuscous triangle within basal angles. Elytra paler on basal portions of costa, opaque except for the shiny veins and the apical margins of wings.

This is a widely distributed species from Pennsylvania to Colorado, and occurs on wild plum, *Prunus* spp.

Illinois Records.—DuBois: Aug. 9, 1917, 1 ♀. Eichorn: June 13, 1934, DeLong & Ross, 1 ♂, 2 ♀.

19. *Macropsis trimaculata* (Fitch)

*Pediopsis trimaculatus* Fitch (1851, p. 60).

Length of female 5.0 mm., male 4.5 mm. Dark brown or black, with three light spots in a row on each elytron, fig. 94. Female dark brown; male almost black. Epimera in both sexes each with a black bar, this occasionally obscured in the male by heavy pigmentation. Female pronotum testaceous, a dusky spot on disc. Male pronotum fuscous. In both sexes scutellum cinereous with a dark triangular spot in each basal angle; elytron with a pellucid white spot near the branching of the first sector, another at the juncture of the anteapical and basal cells, and a third within the third and fourth apical cells.

Occurring principally on wild plum, *Prunus* spp., this species has rather recently come into economic prominence since it has been proved able to transmit the peach yellows virus and cause severe economic losses in peach orchards. It is recorded from the East and as far west as Colorado.

Illinois Records.—URBANA: Augerville, June 23, 1916, 1 ♂. NORTHERN ILLINOIS: 1 ♀.

3. *ONCOPSIS* Burmeister

*Oncopsis* Burmeister (1838, p. 27, pl. 10).

Fig. 92. Vertex short and broad, roundedly produced, blunt. Face shorter and broader than in *Macropsis*. The striae of the pronotum are nearly transverse, not obliquely angled, and are usually not as coarse as in *Macropsis*.

The species of this genus are all shrub and tree inhabiting as far as known. Sixteen species have been recorded for North America, half of which occur in Illinois.

Due to color variations and a lack of structural characters, it is difficult at the present time to separate these species. The following key will serve to separate the female specimens fairly well, but a key to male structural characters has not been devised.

## KEY TO SPECIES

1. Elytra each with five apical and three anteapical cells.....2  
Elytra each with four apical and two anteapical cells.....8. *verticilis*
2. Female seventh sternite truncate, rounded or angularly produced, notched at apex but without projecting teeth.....3  
Female seventh sternite with small apical teeth each side of apical notch.....5
3. Female seventh sternite short, with a broad shallow notch; face usually dark brown or black.....1. *nigrinasi*  
Female seventh sternite with a deeper notch; face usually pale.....4
4. Female seventh sternite long, rounded, with a deep U-shaped notch; female usually a shade of yellow marked with black or orange; male usually darker.....6. *variabilis*  
Female seventh sternite long, triangularly produced, with a shallow emargination; color brown.....5. *sobrius*
5. Female seventh sternite with a broad shallow notch, teeth short, incurved; color gray; elytra subhyaline, spotted.....4. *cognatus*  
Female seventh sternite triangular, with apical teeth more distinctly produced.....6
6. Elytra smoky to brown, with pale hyaline areas.....7  
Elytra hyaline, nervures brown, each with a discal spot and the apex often dusky. Vertex dark brown to black, with a yellow band connecting the ocelli.....3. *pruni*
7. Gray to pale brown; female seventh sternite short, with small median teeth.....2. *minor*  
Usually brownish to reddish brown; female seventh sternite longer, teeth larger, more conspicuous.....7. *fitchi*

1. *Oncopsis nigrinasi* (Fitch)

*Athysanus nigrinasi* Fitch (1851, p. 61).

Length 4 mm. Small, yellowish or often brownish, and with dark brown or black face. In the female, coloration is variable, but as a rule the front, inner margins of lorae, and apexes of femora are dark brown or black. In pale specimens the elytra are subhyaline and with two transverse brown-

ish bands. In dark specimens there are white spots on discal cells, on the anteapical cells, and at base and near apex of clavus. The male is usually uniform brownish, with a yellowish transverse band on vertex and on base of front. Genitalia: Female seventh sternite short and bilobate or sinuate on posterior margin; male with long narrow plates.

This eastern species is reported from hornbeam, viburnum, and hazel.

**Illinois Records.**—ELIZABETHTOWN: May 27–31, 1931, Dozier, 1♀. HARRISBURG: June 25, 1932, Ross, Dozier, & Park, 1♀. HEROD: June 8–11, 1935, DeLong & Ross, 4♀; June 24, 1936, DeLong & Ross, 2♀. KARNAK: June 14, 1934, DeLong & Ross, 1♀.

## 2. *Oncopsis minor* (Fitch)

*Athysanus minor* Fitch (1851, p. 60).

Length 4 mm. Small, resembling *fitchi*, with yellow to brownish color and hyaline elytra. Face coarsely punctured. Disc of pronotum, scutellum, and elytra usually dark in color. White spots on elytra next to scutellum, on discal cells, and on anteapicals. Genitalia: Female seventh sternite with posterior margin slightly produced medially and bearing a pair of short teeth separated by a shallow notch; male plates long and slender.

This species, found in the East, as well as Illinois, is reported as occurring on birch.

**Illinois Record.**—MEREDOSIA: May 29, 1917, 1♀.

## 3. *Oncopsis pruni* (Provancher)

*Bythoscopus pruni* Provancher (1890, p. 290).

Length 4.0–4.25 mm. Grayish, resembling *fitchi*, with hyaline elytra and brownish veins. Vertex coarsely punctured, black, with a broad yellow band connecting the ocelli; front coarsely punctured, yellow. Pronotum yellowish to gray, usually with two or three black points behind each eye. Scutellum pale, with dark basal angles. Elytral nervures brown, commissural nervure white, with brownish spots. Genitalia: Female seventh sternite triangularly produced, with a pair of median acute teeth.

This is a northern transcontinental species known to occur on wild *Prunus*. In recent years transmission of peach yellows has been attributed to it.

**Illinois Record.**—DUBOIS: May 24, 1917, 1♂.

## 4. *Oncopsis cognatus* (Van Duzee)

*Bythoscopus cognatus* Van Duzee (1890?, p. 225).

Length 5 mm. In size and general form resembling *fitchi* but gray in color instead of brownish, and female seventh sternite has a broad shallow depression and minute teeth at middle. In *fitchi*, seventh sternite is triangularly produced. Vertex dull yellow to gray, front brownish to black, pronotum paler on anterior margin. Vertex and pronotum coarsely punctate. Elytra gray, each with a brownish area from tip of clavus to base of anteapical cells. Genitalia: Female seventh sternite longer than in *pruni*, apical margin slightly concave, teeth minute, depressed; male plates long and slender.

This species has been collected from hazelnut, *Corylus americana*, in the north-eastern United States.

**Illinois Records.**—ALGONQUIN: July 8, 1897, 1♀. HEROD: May 29, 1935, Ross & Mohr, 1♂.

## 5. *Oncopsis sobrius* (Walker)

*Bythoscopus sobrius* Walker (1851a, p. 874).

Length 5 mm. Yellowish, with brown elytra. Vertex, pronotum, and scutellum yellow, elytra darker, tawny to brown. Elytra with commissural line alternately marked with paler spots. Genitalia: Female seventh sternite similar to that of *variabilis*, with a small, median, rounded notch.

This species has been collected from birch, *Betula* sp., and associated plants in New England and Canada.

**Illinois Record.**—SAVANNA: June 13, 1917, 1♀.

## 6. *Oncopsis variabilis* (Fitch)

*Athysanus variabilis* Fitch (1851, p. 60).

Length 5 mm. Color and color pattern extremely variable. Of the more common color forms, some are bright yellow, with a black line or band along claval suture, and some are reddish brown, with yellow clavus. Others are yellow throughout, or almost entirely black, especially in the males. Genitalia: Female seventh sternite pro-

duced, and with a median conspicuous U-shaped notch.

Northern transcontinental in distribution, this species has been taken from birch, *Betula* sp., and specimens that are apparently of this species have been collected from hazelnut, *Corylus americana*, and alder, *Alnus* sp.

**Illinois Record.**—HARRISBURG: June 25, 1932, Ross, Dozier, & Park, 1 ♀.

#### 7. *Oncopsis fitchi* Van Duzee

*Athysanus fenestratus* Fitch (1851, p. 60).

Name preoccupied.

*Oncopsis fitchi* Van Duzee (1916, p. 65).

New name.

Length 4.5 mm. Brownish to reddish brown; elytra usually with pale hyaline spots, which are often absent in the males. Face and vertex dusky to brown, with a yellowish transverse band between ocelli. Face sometimes piceous. Basal angles of scutellum usually darker than pronotum. Margin of each clavus along scutellum hyaline, a hyaline spot near apex, and another on disc; also a hyaline spot on anteapical cells. Genitalia: Female seventh sternite triangularly produced, with two small median teeth; male plates long and narrow.

This species occurs on birch, *Betula* sp. It is distributed through the northern United States from Maine to Colorado.

**Illinois Record.**—HARDIN: June 5–9, 1932, Dozier, 1 ♀.

#### 8. *Oncopsis verticis* (Say)

*Jassus verticis* Say (1831, p. 308).

*Oncopsis distinctus* Van Duzee (1890d, p. 225).

Length 3.5–4.5 mm. Readily distinguishable from other species of the genus by the four apical cells and two anteapical cells.

Color variable in both sexes, but male usually darker than female. Female usually yellowish to pale brownish. Male usually brown, with commissural line and large costal spot on apical portion of each elytron pale. Vertex, pronotum, and scutellum punctured with fuscous. Scutellum with a dark triangular spot in each basal angle. Elytra brown, each darker on clavus, with a white spot before apex. Venter yellow. Genitalia: Female seventh sternite long, with a distinct U-shaped median notch, apex rounded; male plates long and narrow.

The species has been taken commonly from black walnut, *Juglans nigra*. Its range is from Maine to Colorado and south to Tennessee; it is rather abundant in different areas of Illinois.

**Illinois Records.**—Many males and females, taken May 25 to October 12, are from Albion, Algonquin, Alton, Castle Rock, Cedar Lake, Danville, Dixon Springs, Freeport, Galena, Grafton, Grand Detour, Hardin, Havana, Herod, Kankakee, Keithsburg, Lacon, Makanda, Marshall, Monticello, Muncie, Normal, Oquawka, Pike, Pinkstaff, Pulaski, Quincy, Urbana, Vienna, Weldon Springs, and White Heath.

#### Subfamily NIONINAE

A single genus of this subfamily occurs in the United States.

#### 4. *NIONIA* Ball

*Nionia* Ball (1915, p. 165).

This genus, which includes but a single species, distributed from the southeastern states to Illinois, was formerly placed in the subfamily with *Macropsis* and *Oncopsis*.



Fig. 95.—*Nionia palmeri*: a, adult; b, male genitalia; c, nymph. (From Osborn.)

*Nionia palmeri* (Van Duzee)5. *AGALLIOPSIS* Kirkaldy

*Goniagnathus palmeri* Van Duzee (1891, p. 171).

Figs. 16, 95. Length 4-5 mm. Short, robust, head conically pointed, vertex almost parallel margined and so strongly arched that the anterior portion of the pronotum is produced decidedly anterior to the anterior margins of the eyes. Shiny black, resembling a *Macropsis* in general appearance. Apical nervures of elytra, ventral margins of eyes, and antennae reddish. Pronotum strongly punctured; distinct lines of punctures bordering veins of elytra. Female seventh sternite slightly produced at middle, pygofer short and broad, obtusely triangular; male valve concealed, plates triangular, acutely angled at apexes.

This is a grass-feeding species in moist woodland areas, and is common throughout central and southern Illinois.

**Illinois Records.**—Males and females, taken May 7 to August 17, are from Alton, Alto Pass, Danville, Dixon Springs, Elizabethtown, Fern Cliff, Grafton, Herod, Oakwood, Odin, and Vienna.

## Subfamily AGALLIINAE

The vertex is short and broad, the ocelli are on the face, and each hind wing has four apical cells.

Three of the five Nearctic genera listed by DeLong & Knull (1945) as belonging to this subfamily occur in Illinois. The subfamily was treated for North America by Oman (1933), who records about 80 species for the United States. The majority of these species are recorded from only western and southwestern states, but several are widely distributed.

## KEY TO GENERA

1. Vertex distinctly longer at middle than next to eyes, fig. 99; pronotum in large part transversely rugulose. . . . . 7. *Aceratagallia*
- Vertex usually shorter at middle than next to eyes, fig. 96; pronotum finely punctured and granulate. . . . . 2
2. Vertex distinctly shorter at middle than next to eyes; posterior margin of head sinuate behind eyes, figs. 96, 97. . . . . 5. *Agalliopsis*
- Vertex of nearly uniform length throughout its width; margin of head straight behind eyes, fig. 102. . . . . 6. *Agallia*

*Agalliopsis* Kirkaldy (1907, p. 30).

Fig. 114. Median portion of vertex very short, usually longer next to eyes; posterior margin sinuately curved laterally and extending some distance behind the eyes. Lateral margins of pronotum obsolete. Elytra long and narrow. Male styles forked.

Two species generally distributed over the eastern states have been collected in Illinois.

## KEY TO SPECIES

- Female seventh sternite, fig. 97C, truncate or slightly produced; male plates, fig. 97B, elongate narrow, surpassing pygofer in length, concavely constricted at middle. Pronotum, fig. 97A, unmarked, or with a median fuscous line and a spot on each side. . . . . 1. *peneoculata*
- Female seventh sternite, fig. 96C, broadly and deeply concave; male plates, fig. 96B, short, triangular, gradually tapered from bases to blunt apexes, distinctly shorter than pygofer. Pronotum, fig. 96A, with at least two spots on each side of middle; elytra pale, each with a transverse fuscous band across the middle of clavus. . . . . 2. *novella*

1. *Agalliopsis peneoculata* Oman

*Agalliopsis peneoculata* Oman (1933, p. 17).

Fig. 97A. Length 4.0-4.5 mm. Resembling *oculata* in size and form but with the elytra concolorous except for an indistinct transverse smoky bar just posterior to the forking of the first sector. Vertex shorter at middle than next to eyes. Pronotum with posterior margin nearly straight. Elytra long and tapering. Genitalia: Female seventh sternite, fig. 97C, with posterior margin broad and convex. Male plates, fig. 97B, long, lateral margins concave on basal two-thirds, tips bluntly rounded; aedeagus, fig. 106, long and slender, the tip in dorsal view appearing very broad and somewhat bilobed.

This species was previously recorded from New York, Connecticut, and Michigan.

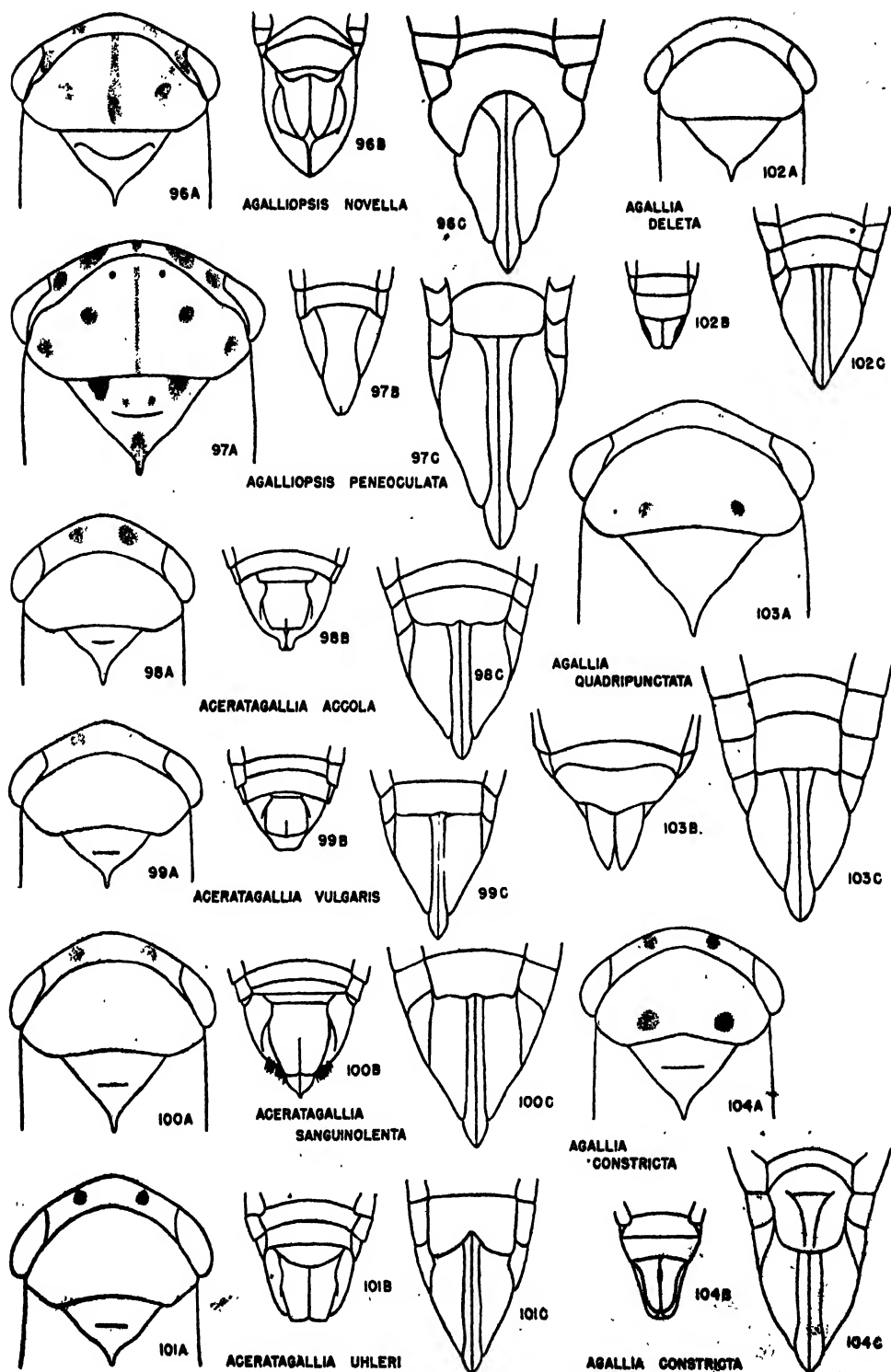
**Illinois Record.**—KARNAK: June 14, 1934, DeLong & Ross, 1 ♂, 10 ♀.

2. *Agalliopsis novella* (Say)

*Jassus novellus* Say (1831, p. 309).

*Macropsis nobilis* Forbes (1885, p. 22).

Fig. 96A. Length 3.5-4.0 mm. Color usually light testaceous, sometimes darker;



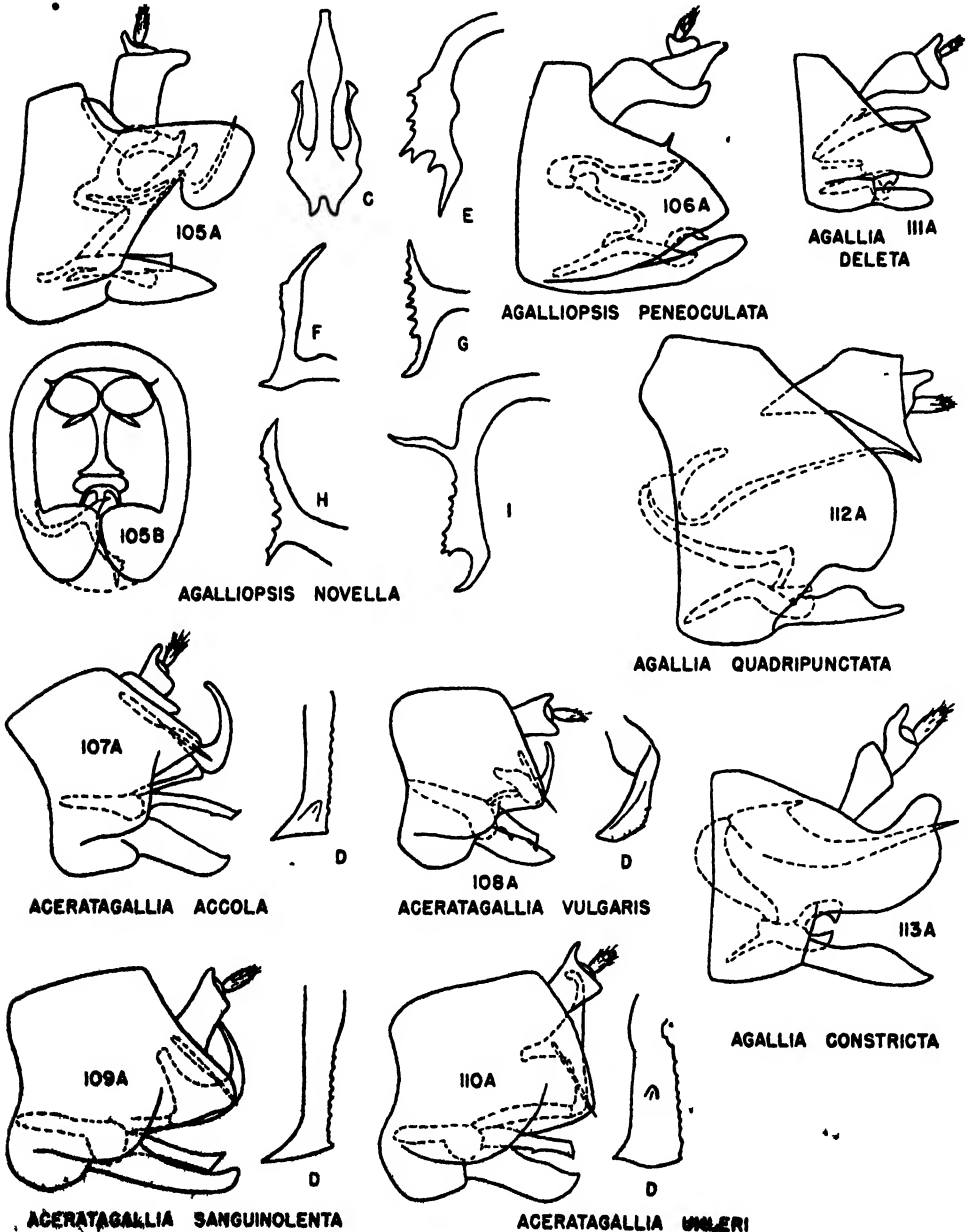
Figs. 96-104.—Agalliinae. A, head and pronotum; B, male external genitalia; C, female genitalia. (From Oman.)



margins of ocelli, a round spot behind each ocellus on vertex, and an elongate spot next to each eye black. Pronotum with a median stripe and a spot on either side brown. All of these markings may vary in intensity. Elytra brown to black, veins pale. Genitalia: Female seventh sternite, fig. 96C, with posterior margin broadly and roundedly

excavated at middle, lateral lobes rounded or somewhat pointed. Male valve, fig. 96B, short, emarginate posteriorly; plates semi-tubular, bluntly rounded at apices, and scarcely covering the opening of the large genital chamber. The internal male genital structures are variable in form, fig. 105.

This is a common species on herbaceous



Figs. 105-113.—Agallinae, male genitalia. A, lateral view; B, caudal view; C, aedeagus; D, style; E-I, pygifer hook, showing variation. (From Oman.)

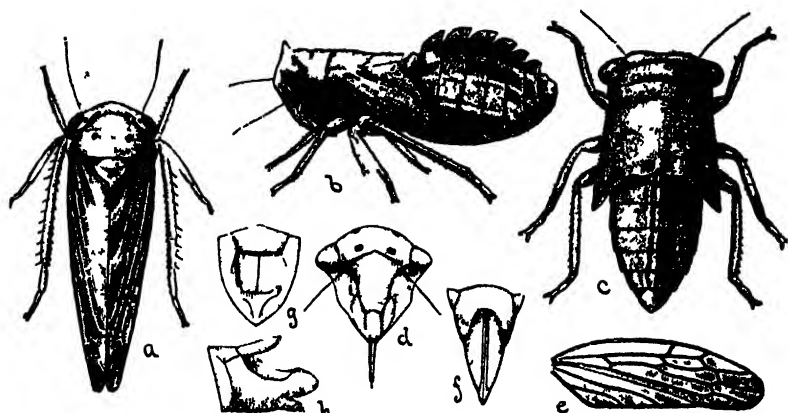


Fig. 114.—*Agalliopterus novella*: a, adult, b, c, nymph; d, face; e, elytron; f, female genitalia; g, h, male genitalia. (From Osborn.)

vegetation, and occurs throughout the eastern United States.

**Illinois Records.**—Many males and females, taken March 20 to October 2, are from Aldridge, Algonquin, Alton, Alto Pass, Anna, Apple River Canyon State Park, Augerville, Carbondale, Cave in Rock, Champaign, Chester, Danville, Dixon Springs, Dolson, Dongola, East Cape Girardeau, Eichorn, Elizabethtown, Fern Cliff, Fountain Bluff, Freeport, Golconda, Grand Detour, Hardin, Havana, Herod, Homer, Jonesboro, Kankakee, Karnak, Mahomet, Makanda, Monmouth, Monticello, Muncie, Normal, Oakwood, Olive Branch, Oregon, Port Byron, Quincy, Rock Island, Savanna, Shawneetown, Sparta, Topeka, Urbana, Ursa, Vienna, Volo, Weldon Springs, White Heath, White Pines Forest State Park, Wolf Lake, and Zion.

## 6. *AGALLIA* Curtis

*Agallia* Curtis (1833, p. 192).

Vertex short, usually about uniform in length over its entire width; posterior margin evenly curved, not extending behind the eyes laterally. Pronotum short, lateral margins almost obsolete. Elytra usually short.

This genus contains two of the most common species of leafhoppers in Illinois. One of them, *constricta*, is often found in large numbers on economic crops.

### KEY TO SPECIES

1. Pale brown, without dark spots on vertex and pronotum, fig. 102A
3. *deleta*
- Pale to dark brown, with four distinct black spots on vertex and pronotum, figs. 103A, 104A
- 2

2. Robust; female seventh sternite, fig. 103C, truncate or slightly concave; male plates, fig. 103B, narrowed and pointed, tips diverging
1. *quadripunctata*
- More slender, wedge shaped; female seventh sternite, fig. 104C, roundedly and convexly produced; male plates, fig. 104B, narrowed near base and then produced, convexly rounded to blunt, and with appressed apexes

### 2. *constricta*

#### 1. *Agallia quadripunctata* (Provancher)

*Bythoscopus quadripunctatus* Provancher (1872, p. 376).

*Ulopa canadensis* Van Duzee (1892c, p. 301). (Immature specimens).

Fig. 103A. Length 4 mm. Robust, varying in color from pale brown to fuscous. Two obliquely converging black spots on front margin of vertex and a pair of black spots on pronotum near posterior margin. Elytra light brown, veins pale. Female seventh sternite, fig. 103C, with posterior margin truncate. Male plates, fig. 103B, small, acutely angled, their lateral margins convex, the plates as long as the pygofer. Male internal genitalia as in fig. 112.

Experimental work reported by Black & Oman (1947) indicates that in the eastern United States the species normally reproduces parthenogenetically. Their cultures of the species were maintained on crimson clover, *Trifolium incarnatum*.

A common species in the northeastern United States, *quadripunctata* occurs abundantly in moist open woodland areas.

**Illinois Records.**—Many males and females, taken March 4 to January 16, are from Algonquin, Alto Pass, Antioch, Beach, Bloomington, Carbondale, Champaign,

Chester, Chicago, Cypress, Danville, Dixon Springs, Dolson, Dongola, Eichorn, Elizabethtown, Fountain Bluff, Fox Lake, Geff, Golconda, Grafton, Herod, Homer, McHenry, Mahomet, Monticello, Muncie, Normal, Oakwood, Olive Branch, Pulaski, Quincy, Rago, Rock Island, Springfield, Thebes, Urbana, Vienna, White Heath, Wilmington, and Zion.

## 2. *Agallia constricta* Van Duzee

*Agallia constricta* Van Duzee (1894a, p. 90).

Fig. 104A. Length 3.25–3.75 mm. Light brown in color, a pair of black spots on the anterior margin of the vertex behind ocelli, and another pair behind these on the posterior margin of the pronotum. Elytra brown, veins paler. Female seventh sternite, fig. 104C, twice as long as preceding, keeled medially; lateral angles produced and rounded, central portion of posterior margin shallowly notched on median line. Male plates, fig. 104B, broad at bases, narrowed to median constriction and then slightly widened caudally, plates together rounded at apex; pygofer slightly longer and broader than plates. Male internal genitalia as in fig. 113.

This is probably the most common species of *Agallia* in the eastern United States.

**Illinois Records.**—Many males and females, taken April 18 to September 24, are from Albion, Alton, Alto Pass, Anna, Cache, Cairo, Carbondale, Carman, Cave in Rock, Cobden, Dixon, Dolson, Dongola, Dubois, East Cape Girardeau, Eichorn, Elizabethtown, Fountain Bluff, Fulton, Golconda, Grand Tower, Harrisburg, Havana, Herod, Homer, Kampsville, Karnak, Kirkwood, La Rue, Luna, Macomb, Meredosia, Metropolis, Monmouth, Mount Carmel, Mount Sterling, Muncie, Murphysboro, Niota, Oakwood, Oquawka, Parker, Pike, Pulaski, Putnam, Quincy, Rosiclare, Saratoga, Seymour, Shawneetown, Sparta, Sumner, Texas City, Thebes, Unity, Urbana, Urssa, Vandalia, Vienna, and Wolf Lake.

## 3. *Agallia deleta* Van Duzee

*Agallia deleta* Van Duzee (1909a, p. 210).

*Agallia immaculata* Lathrop (1917, p. 120).

Fig. 102A. Length 2.5–3.0 mm. Robust, vertex uniform in length and evenly rounded. Color usually pale brown, without definite markings. Elytra subhyaline, appear-

ing dark. Males frequently darker than females. Female seventh sternite, fig. 102C, short, posterior margin truncate but often appearing concave. Male plates, fig. 102B, small, broad at base, abruptly narrowed to blunt apices; aedeagus in lateral view appearing broad and almost straight, in dorsal view appearing laterally compressed and with apex divided for a short distance; the flaplike projections of the posterior margins of pygofer are turned slightly inward; internal genitalia as in fig. 111.

This is a common grass species in the southern states and along the Atlantic sea coast. It possibly occurs in Illinois.

## 7. *ACERATAGALLIA* Kirkaldy

*Aceratagallia* Kirkaldy (1907, p. 30).

Vertex short, usually distinctly longer at middle than next to eyes; posterior margin broadly rounded, not produced behind the eyes. Lateral margins of pronotum very short. Elytra about as long as abdomen. Male styles not forked.

This genus contains some of the smallest individuals of the subfamily; a few species are extremely abundant and important economic pests. Within the genus the species are almost identical on the basis of external characters. The males, however, are readily identified by characters of the internal genitalia. The females are difficult to identify on any basis, but the few characters that will aid in their identification have been offered in the following key.

### KEY TO SPECIES

1. Females 5  
Males 2
2. Each style, fig. 108D, strongly curved laterally, twisted and somewhat keeled 1. *vulgaris*  
Each style not strongly curved or twisted, but straight and boat shaped 3
3. Each style, fig. 110D, broad, outer point slightly produced; aedeagus shaft, fig. 110A, straight, hooked at apex. 4. *uhleri*  
Each style narrowed, foot shaped, outer point sharp, conspicuous; aedeagus shaft strongly curved dorsally 4
4. Each style, fig. 107D, with ventral tooth. Size 2.5–2.75 mm., dark in color. Male plates, fig. 98B, shorter than pygofer 2. *accola*  
Each style, fig. 109D, without ventral tooth. Size 2.75–3.0 mm., brown to gray in color. Male plates, fig. 100B, reaching apex of pygofer ..... 3. *sanguinolenta*

5. Female seventh sternite, fig. 101C, broadly, rather shallowly, and angularly excavated.....4. *uhleri*  
 Female seventh sternite truncate or sinuate, not excavated, as in figs. 98C-100C.....6  
 6. Length 3.0-3.25 mm.....3. *sanguinolenta*  
 Smaller in size, 2.75-3.0 mm.....1. *vulgaris*, 2. *accola*

### 1. *Aceratagallia vulgaris* Oman

*Aceratagallia vulgaris* Oman (1933, p. 60).

Fig. 99A. Length 2.5-3.0 mm. Similar to *sanguinolenta* but usually paler in color. Yellowish brown to darker brown, vertex with a black spot above each ocellus; often a dark median line on vertex and pronotum. Elytra subhyaline, veins brown. Female seventh sternite, fig. 99C, with posterior margin almost truncate, faintly notched at middle. Male valve, fig. 99B, very short, often concealed by eighth sternite; plates short and broad, wider at apex than at base, apexes almost truncate. Male internal genitalia as in fig. 108.

This is a common form in the Mississippi River valley. It occurs abundantly upon the Illinois prairies. It can be distinguished from all the other eastern species by the twisted styles. For many years it was named *cinerea* (Osborn & Ball) and is commonly found in eastern and midwestern collections under that label. The true *cinerea* is a western species.

**Illinois Records.**—Many males and females, collected June 12 to October 2, are from Albion, Alto Pass, Alton, Ashley, Barry, Carbondale, Cave in Rock, Dongola, Dubois, Fairfield, Fountain Bluff, Galena, Geff, Gibsonia, Murphysboro, Oak Lawn, St. Anne, St. Joseph, Shawneetown, Vienna, and White Pines Forest State Park.

### 2. *Aceratagallia accola* Oman

*Aceratagallia accola* Oman (1933, p. 57).

Fig. 98A. Length 2.5-3.0 mm. Dark brown, with a brown spot above each ocellus and a brown area next to each eye. Resembling *sanguinolenta* but smaller, more robust, and darker in color. Female seventh sternite, fig. 98C, slightly produced at middle, posterior margin shallowly and roundly notched at middle, slightly sinuate on either side of notch. Male valve, fig. 98B, short, truncate, appearing transverse; plates

short, slightly narrowed to truncate apexes. Male internal genitalia as in fig. 107.

This eastern species cannot be distinguished easily from *sanguinolenta*, but the smaller size and darker color will usually assist in its identity. An examination of the male internal genitalia will easily verify or disprove the identification from external characters.

**Illinois Records.**—DUBOIS: sweeping from grass, July 2, 1909, 1♂, 1♀. FOREST CITY: sand, June 6, 1905, Hart, 1♂.

### 3. *Aceratagallia sanguinolenta* (Provancher)

*Bythoscopus sanguinolenta* Provancher (1872, p. 376).

*Bythoscopus siccifolius* Uhler (1877, p. 359).

Fig. 100A. Length 2.75-3.25 mm. Robust, light brown with fuscous markings. A black or dark brown spot above each ocellus, a light brown patch next to each eye, and a longitudinal light brown stripe each side of pale median line. Pronotum irregularly marked with fuscous on anterior margin and with indistinct longitudinal stripes. Elytra pale brown, veins brown, marked with white on clavus. Female seventh sternite, fig. 100C, as in *accola*, but with lateral angles more distinct, posterior margin shallowly and medially notched.

Male valve, fig. 100B, short, truncate, transverse; plates rather broad, lateral margins convexly and roundedly narrowed to truncate apexes. Male internal genitalia as in fig. 109.

This is the most widespread and abundant species of the genus. It occurs throughout the eastern states and Canada and has been recorded as far west as Utah and Arizona. It occurs abundantly upon many economic crops and causes heavy feeding injury. Commonly known as the clover leafhopper, it is probably most abundant upon legume hosts.

**Illinois Records.**—Many males and females, collected June 13 to October 3, are from Albion, Alton, Amboy, Antioch, Anvil Rock, Apple River Canyon State Park, Barry, Beach, Cave in Rock, Decatur, Des Plaines, Dixon, Dixon Springs, Eichorn, Evergreen Park, Fulton, Galena, Gibsonia, Grafton, Grand Tower, Hanover, Havana, Herod, Kampsville, Kinmundy, Marshall, Norris City, Oak Lawn, Oakwood, Ogden, Pike, Port Byron, St. Anne, St. Joseph, Savanna, Sheffield, Springfield, Starved

Rock State Park, Summit, Thomson, Vienna, Volo, Watson, White Pines Forest State Park, and Zion.

#### 4. *Aceratagallia uhleri* (Van Duzee)

*Agallia uhleri* Van Duzee (1894a, p. 91).

Fig. 101A. Length 3.25–3.75 mm. Resembling *sanguinolenta* but more slender and with the female seventh sternite deeply notched posteriorly. Vertex slightly swollen between ocelli, longer at middle than next to eyes, posterior margin broadly and evenly rounded. Elytra each with three anteapical cells. Color brownish cinereous. Face pale yellowish. Spots on vertex above ocelli round and black. Scutellum with triangular basal spots black and with a dark transverse suture. Elytra subhyaline, sometimes fuscous along commissural line, veins dark, occasionally with white spots. Genitalia: Female seventh sternite, fig. 101C, with posterior margins angularly excavated nearly half way to the base. Male plates, fig. 101B, heavy, lateral margins straight, slightly converging, tips truncate, about equaling pygofer in length; styles, fig. 110D, each broad on posterior portion, tip truncate, outer point slightly produced, inner margin serrate; ventral tooth of style sharp and slightly hooked; tip of aedeagus, fig. 110A, as seen in lateral view, bent sharply upward.

This species is common in the plains region west of the Mississippi River.

Illinois Records.—ALTON: June 26, 1934, DeLong & Ross, 3 ♀. APPLE RIVER CANYON STATE PARK: July 11, 1934, Frison & DeLong, 1 ♀. PIKE: Mississippi floodplain, June 28, 1934, 1 ♀.

#### Subfamily BYTHOSCOPIINAE

This subfamily is characterized by a short vertex and by forewings that are set with short conspicuous setae.

Only one genus, *Stragania*, is known to occur in the United States.

#### 8. *STRAGANIA* Stål

*Stragania* Stål (1859, p. 49).

*Pachypsis* Uhler (1877, p. 466).

*Gargapsis* Fowler (1896, p. 167).

Figs. 17, 29. Head, including eyes, narrower than pronotum, very short, parallel margined, slightly but broadly rounded, almost truncate. Pronotum large, finely and

transversely striate. Elytra short and broad, deeply punctured, covered with hairs.

Twenty species are known to occur in North America. Of this number only three are found in the eastern United States and one of these occurs only in that portion along the coast of the Gulf of Mexico.

#### 1. *Stragania apicalis* (Osborn & Ball)

*Macropsis apicalis* Osborn & Ball (1898, p. 64).

*Macropsis alabamensis* Baker (1900a, p. 58).

Fig. 115. Length 4.5–5.0 mm. Broad and robust, green, with anterior half of pronotum washed with yellow. Elytra green, covered with greenish hairs. A faint line along claval suture, apex of clavus, and apical margin of each elytron brown to black. Venter and legs deep green, tips of tarsi black. Each elytron exceeding abdomen in length and with a broad appendix, the whole surface except appendix covered with short hair. Female seventh sternite with posterior margin broadly rounded and with slight notch at center. Male valve long, truncate, plates rather short, triangular, apices angled.

This is a common species throughout the state on honey locust.

Illinois Records.—Many males and females, taken May 27 to September 22, are from Alton, Barry, Byron, Danville, Dar-

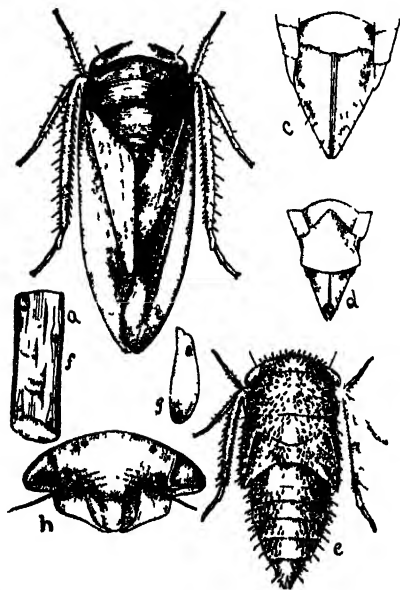


Fig. 115.—*Stragania apicalis*. (From Osborn.)

win, Dongola, Dubois, Du Quoin, Eichorn, Elizabethtown, Fairfield, Grand Tower, Hanover, Ludlow, Makanda, Meredosia, Monticello, Paxton, Shawncetown, Urbana, and Vienna.

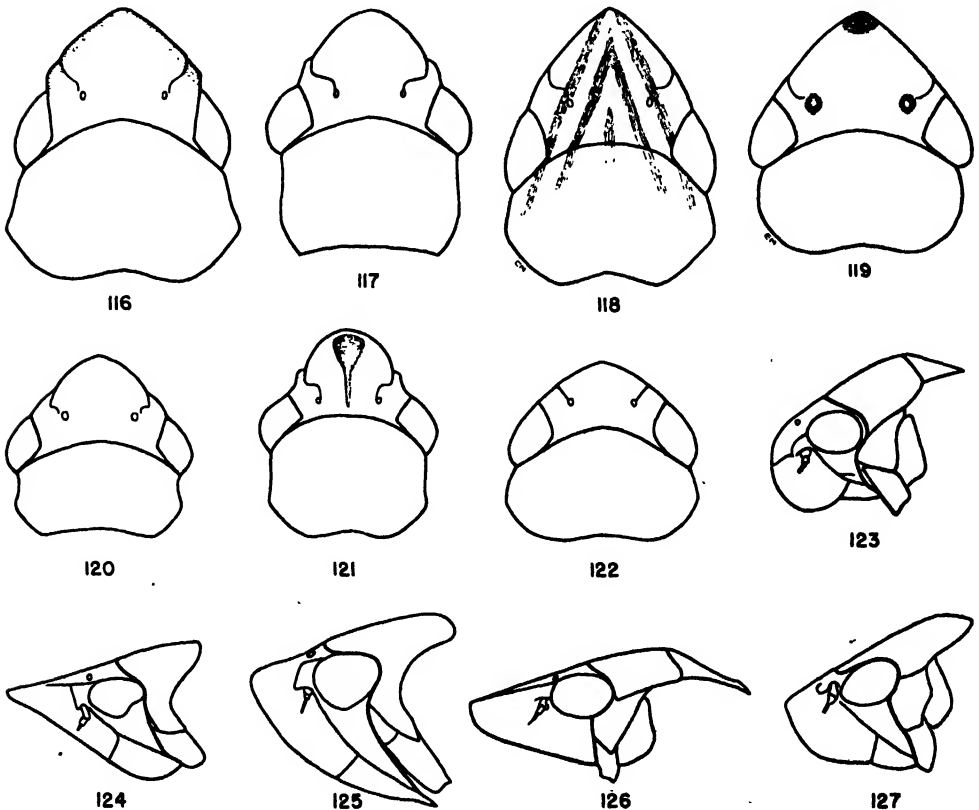
### Subfamily TETTIGONIELLINAE

The cylindrical-shaped body with ocelli on the disc of vertex, and the three apical cells in the hind wing will usually distinguish this group. The frontal sutures extend over the anterior margin of vertex nearly to the ocelli.

Representatives of 11 of the 15 Nearctic genera in this group occur in Illinois. More species of the subfamily occur in the West than in the East.

### KEY TO GENERA

1. Posterior corner of pronotum nearly right angled, fig. 117; two claval veins nearly always joined, as in figs. 128, 129.... 2
- Posterior corner of pronotum obtuse or rounded; claval veins, if present, never touching..... 3
2. Face bulbously inflated, fig. 123; claval veins at most slightly coalesced or connected by a short veinlet, fig. 129..... 11. *Oncometopia*  
Face convexly sloping, fig. 126; claval veins broadly coalesced and sometimes with secondary branches, fig. 128..... 12. *Homalodisca*
3. Margin of vertex with a distinct angulate swelling above each antenna, fig. 127; vertex with a deep longitudinal furrow from near base almost to apex, fig. 121..... 9. *Aulacizes*  
Margin of vertex without an angulate swelling above antenna; vertex at most



### Tettigoniellinae, heads and thoraxes

- Fig. 116.—*Graphocephala coccinea*.  
Fig. 117.—*Oncometopia undata*.  
Fig. 118.—*Sibovia occatoria*.  
Fig. 119.—*Plesiommata tripunctata*.  
Fig. 120.—*Cuerna lateralis*.  
Fig. 121.—*Aulacizes irrorata*.

- Fig. 122.—*Kolla bifida*.  
Fig. 123.—*Oncometopia undata*.  
Fig. 124.—*Draeculacephala producta*.  
Fig. 125.—*Carneocephala flaviceps*.  
Fig. 126.—*Homalodisca triquetra*.  
Fig. 127.—*Aulacizes irrorata*.

- depressed toward middle of anterior margin.....4
4. Posterior margin of pronotum broadly and evenly emarginate and almost parallel with anterior margin, fig. 120.....10. *Cuernia*
- Posterior margin of pronotum very shallowly emarginate to subtruncate, and not parallel with anterior margin.....5
5. Elytra with apical part reticulate veined, fig. 130.....6
- Elytra not reticulate veined, as in fig. 129.....7

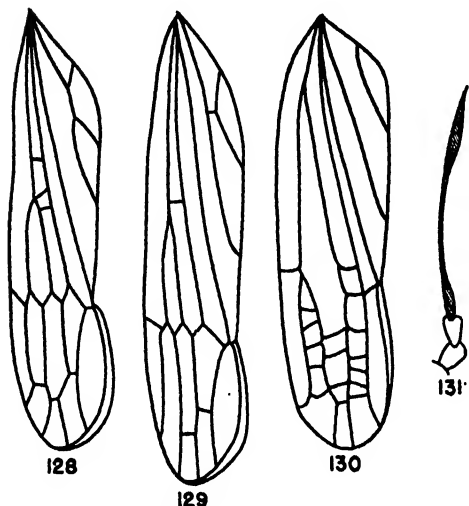


Fig. 128.—*Homalodisca triquetra*, elytron.

Fig. 129.—*Oncometopia undata*, elytron.

Fig. 130.—*Draeculacephala* sp., elytron.

Fig. 131.—*Helochara communi*, ♂ antenna.

6. Front appearing nearly straight in profile, fig. 124; vertex flattened, depressed behind apex and anterior to ocelli, fig. 134.....19. *Draeculacephala*
- Front appearing convex in profile, fig. 125; vertex slightly convex and without depressions.....16. *Carneocephala*
7. Entire upper surface closely punctured, uniform green and rather dull in luster; antenna of male enlarged or flattened at apex, fig. 131.....15. *Helochara*
- Upper surface nearly always smooth, at least elytra unpunctured; antenna of male slender.....8
8. Vertex pointedly produced, with margins nearly straight from eye to apex, fig. 119; clavus with one vein; elytra white, with longitudinal veins broadly striped with brown.....18. *Plesiommata*
- Vertex more bluntly produced, with margins more convex from eye to apex, as in fig. 118; clavus usually with two distinct veins, but sometimes veins absent.....9
9. Antennae at least half as long as body; head and pronotum with a median and two pairs of narrow diagonal dark stripes, fig. 118.....21. *Sibovia*

- Antennae not longer than width of head; head and pronotum without diagonal stripes.....10
10. Head wider than pronotum, fig. 31; anterior margin of vertex with a median dark spot usually not joined by any other markings.....20. *Neokolla*
- Head usually distinctly narrower than pronotum; dark spot at anterior margin of vertex, if present, joined by other markings.....11
11. Vertex less than one and one-half times as wide as long; face usually very pale yellowish; anterior margin of vertex with a narrow dark band from eye to eye, fig. 116.....17. *Graphocephala*
- Vertex at least one and two-thirds times as wide as long; face usually dark; anterior margin of vertex without a distinct narrow band, as in fig. 122.....12
12. Brown to shiny black, without black bands.....13. *Ciminius*
- Green, with black transverse bands on vertex and pronotum, fig. 133.....14. *Kolla*

## 9. *AULACIZES* Amyot & Serville

*Aulacizes* Amyot & Serville (1843, p. 571).

Figs. 121, 127. Posterior corner of pronotum obtusely rounded to the slightly emarginate posterior margin; pronotum narrower than head. Lateral margin of vertex with an angulate swelling above antennal base; anterior margin evenly rounded; disc of vertex with a deep longitudinal furrow, which is broadened anteriorly behind apex. Front appearing very convex in profile and distinctly angled with vertex. Claval veins not joined.

Two species are recorded in this genus for the United States. One is known only from Florida, and the other is widely distributed throughout the eastern United States.

### 1. *Aulacizes irrorata* (Fabricius)

*Cicada irrorata* Fabricius (1794, p. 33).

*Cicada nigripennis* Fabricius (1794, p. 32).

*Aulacizes rufiventris* Walker (1851a, p. 796).

Length 12.5 mm. Reddish brown, irrorate with yellow. Head triangular, apex rounded, fig. 121. Vertex a little shorter than basal width, surface irregular and with median furrow and carinate margin. Pronotum hexagonal, coarsely pitted. Color varying from light to dark reddish brown, with black blotches on vertex and scutellum. Spots on costal margin of each elytron and many irrorations yellow. Female seventh sternite with posterior margin broadly

rounded, shallowly notched at middle. Male plates together concavely triangular.

Frequently taken from rank herbaceous growths of vegetation and occurring many times in the shrubby habitats, this species occurs throughout the eastern United States and as far west as Texas.

**Illinois Records.**—Many males and females, taken April 17 to October 5, are from Aldridge, Ashley, Brownfield, Cave in Rock, Central City, Centralia, Charleston, Danville, Dixon Springs, Dolson, Dongola, Dubois, East St. Louis, Elizabethtown, Fern Cliff, Fountain Bluff, Golconda, Grafton, Grand Tower, Hardin, Havana, Herod, Homer, Jacksonville, Jonesboro, Makanda, Manchester, Marshall, Metropolis, Muncie, Oakwood, Parker, Pine Hills, Pounds, Quincy, St. Joseph, Starved Rock State Park, Stonefort, Urbana, Vienna, West Union, White Heath, and Wolf Lake.

## 10. *CUERNA* Melichar

*Cuerna* Melichar (1924, p. 199).

Fig. 120. Posterior corner of pronotum obtuse, posterior margin broadly and evenly emarginate, almost parallel with anterior margin; pronotum narrower than head. Lateral margin of vertex slightly rounded above antennal base; anterior margin a little angulate at apex. Disc of vertex a little depressed. Claval veins not joined.

Fourteen species are recorded in the genus by DeLong & Knull (1945). Two species have been taken in Illinois; the others are western and southwestern (Oman & Beamer 1944).

### KEY TO SPECIES

Elytra reddish, wing veins dark; surface of elytra finely rugose between veins.....  
.....1. *lateralis*  
Elytra black; surface of elytra, especially in basal region, with distinct punctures.....  
.....2. *limbata*

### 1. *Cuerna lateralis* (Fabricius)

*Cercopis lateralis* Fabricius (1798, p. 524).

*Cercopis marginella* Fabricius (1803, p. 96).

New name.

*Cercopis costalis* Fabricius (1803, errata). New name.

*Tettigonia striata* Walker (1851a, p. 775).

*Tettigonia lugens* Walker (1851a, p. 775).

*Tettigonia pyrrhotelus* Walker (1851a, p. 775).

Length 7-8 mm. Elytra red, marked with black nervures. Vertex and pronotum black,

irrorate with yellow, reflexed portions margined with yellow. Scutellum black, median line and other markings yellow. Face black, with very small yellow spots; margin of body with a yellow stripe extending from apex of vertex to each eye, and on each side of thorax and abdomen to pygofer. Female seventh sternite truncate posteriorly. Male plates triangular, a little longer than basal width.

Abundant in pastures and in herbaceous growth in cut-over areas, this species is distributed throughout the eastern United States and occurs as far west as California.

**Illinois Records.**—ALTON: June 26-27, 1934, DeLong & Ross, 2♂, 3♀. CAVE IN ROCK: Oct. 2, 1934, Ross & Frison, 2♂, 2♀. GRAFTON: June 26, 1934, DeLong & Ross, 2♂; Oct. 5, 1939, Ross & Burks, 1♀.

### 2. *Cuerna limbata* (Say)

*Tettigonia limbata* Say (1825, p. 340).

Length 8 mm. Similar in size and shape to *lateralis*, but black, with a few very small yellowish spots on vertex, pronotum, and scutellum. Face black, with small yellow spots. Surface of elytra, especially in basal region, distinctly punctured. Female seventh sternite similar to that of *lateralis*.

This species has been recorded from the middle western states and as far west as California and Colorado.

**Illinois Record.**—OAKWOOD: Middle Fork, April 26, 1911, 2♀.

## 11. *ONCOMETOPIA* Stål

*Oncometopia* Stål (1869, pp. 60, 62).

Figs. 117, 123. Head broader than pronotum, vertex rounded, obtuse, disc convex, rounding to front, eyes prominent, front gibbous; a distinct ledge over antennal socket. Pronotum short, broadly rounding in front. Elytra narrow, the lateral margins of abdominal segments exposed.

Of the three species that occur in North America, only one is common in the eastern United States.

### 1. *Oncometopia undata* (Fabricius)

*Cicada undata* Fabricius (1794, p. 32).

*Cicada orbona* Fabricius (1798, p. 520).

*Proconia nigricans* Walker (1851a, p. 783).

*Proconia clarior* Walker (1851a, p. 784).

*Proconia lucerneae* Walker (1851a, p. 785).

*Proconia marginata* Walker (1851a, p. 785).

*Proconia badia* Walker (1851a, p. 786).



*Proconia scutellata* Walker (1851a, p. 786).  
*Proconia tenebrosa* Walker (1851a, p. 787).  
*Proconia plagiatia* Walker (1851a, p. 788).  
*Oncometopia alpha* Fowler (1899, p. 232).

Fig. 132. Length 13 mm. Vertex roundly right angled and two-thirds as long as basal width; color orange yellow, marked with an incomplete circle before the middle, open in front, and with light radiating lines; a marginal line from eye to apex. Anterior portion of pronotum and scutellum slate blue to black. Elytra brownish or reddish, apex distinctly lighter than basal region; anterior margins of elytra in female sometimes with a rounded granulate exudation. Female seventh sternite with posterior margin forming three equal rounded lobes. Male plates short, half the length of seventh sternite.

A species common in pastures on ironweed, *Vernonia* sp., and similar rank growth in weedy areas, *undata* is distributed throughout the eastern United States and occurs westward to Texas and North Dakota.

**Illinois Records.**—Many males and females, taken May 12 to November 7, are from Aledo, Algonquin, Allerton, Alto Pass, Anna, Ashley, Belleville, Cairo, Carbondale, Cave in Rock, Centralia, Champaign, Clay City, Cobden, Dix, Dixon Springs, Dolson, Dubois, East St. Louis, Edwardsville, Eic-

horn, Elizabethtown, Fountain Bluff, Golconda, Goreville, Grafton, Grand Tower, Havana, Herod, Homer, Hookdale, Jonesboro, Kampsville, Kankakee, Karnak, Mahomet, Mascoutah, Momence, Mound City, Muncie, Murphysboro, Nashville, Norris City, Oakwood, Olive Branch, Olney, Pana, Pankeyville, Parker, Pine Hills, Posey, Pulaski, Rago, Richview, Seymour, Shawneetown, Springfield, Urbana, Waltersburg, White Heath, Wolf Lake, and York.

## 12. *HOMALODISCA* Stål

*Homalodisca* Stål (1869, pp. 60, 63).

Figs. 126, 128. Vertex and pronotum deflexed, vertex triangular, wider than pronotum, and with large prominent eyes; vertex forming an acute angle with front, which appears straight or flat when viewed laterally. Pronotum quadrangular.

Five species of this genus are known to occur in North America. Four of them are confined to the Southwest and one is found in the southern states, where it occurs from South Carolina to Arkansas and Texas. Since the state of Illinois extends southward to the junction of the Ohio and Mississippi rivers, and cotton is commonly grown in this area, it may be that *Homalodisca triquetra*, which is a common pest of cotton in the South, will be found in this area at some future time.

### 1. *Homalodisca triquetra* (Fabricius)

*Cicada triquetra* Fabricius (1803, p. 63).  
*Tettigonia vitripennis* Germar (1821, p. 61).  
*Tettigonia coagulata* Say (1832, p. 13).  
*Proconia excludens* Walker (1851b, p. 98).  
*Tettigonia ichthyocephala* Signoret (1854, p. 494).  
*Proconia admittens* Walker (1858, p. 227).  
*Proconia aurigena* Walker (1858, p. 228).

Length 13 mm. Elongate, with triangular head, which is strongly produced and bluntly angled. Vertex as long as width between eyes at base and slightly longer than pronotum; disc flat, sloping to a median furrow. Vertex, pronotum, and scutellum dark brown, finely and irregularly irrorate with yellow. Elytra each subhyaline, tinged with brown, a broad pale transverse band before middle, and a reddish spot before apical cells that extends anteriorly along the costa. Face and venter orange yellow. Female seventh sternite elongate, with produced lateral angles, between which the posterior margin is rather widely and deeply exca-

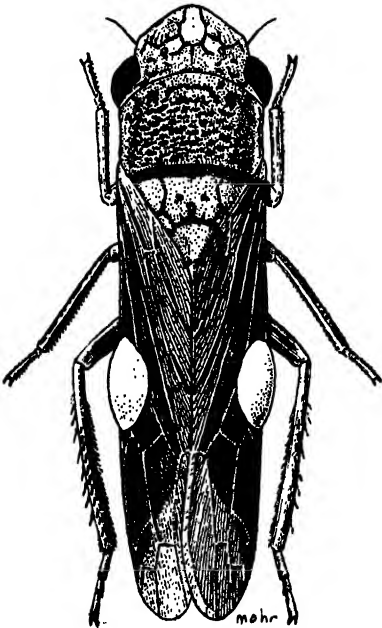


Fig. 132—*Oncometopia undata*.

vated; male plates triangular, one-third longer than basal width, apices acutely angled.

This species is distributed throughout the southeastern United States and is known to occur as far west as Texas.

### 13. *CIMINIUS* Metcalf & Bruner

*Ciminius* Metcalf & Bruner (1936, p. 944).

Related to *Kolla*. Vertex triangular, broader than long; the anterior margins continuing from the margins of the eyes; the dorsal surface sloping to meet the slightly inflated face.

#### 1. *Ciminius hartii* (Ball)

*Tettigonia hartii* Ball (1901, p. 61).

Length 3.75–5.0 mm. Short and robust, with dimorphic sex colors; female grayish brown, male shiny black. Vertex twice as wide as long. Female with ocelli and a pair of spots behind them black; anterior part of vertex darker, with a light spot at apex; pronotum brown, anterior margin yellowish, a dark spot behind either eye; basal angles of scutellum black; elytra gray, nervures yellowish, claval margins pale blue. Male with white spot on apex of vertex; pale circles around ocelli and at apex of scutellum.

Female seventh sternite with truncate posterior margin bearing a median tooth formed by an incision on either side of center. Male plates very short, triangular, apices blunt.

The species occurs in pasture and meadow areas and has been taken in the *Aristida gracilis* habitat. It is distributed rather abundantly through the eastern United States and occurs as far west as Texas and New Mexico.

**Illinois Records.**—Males and females, taken June 14 to October 2, are from Alton, Carbondale, Cave in Rock, Centralia, Cobden, Dubois, Hardin, Herod, Marshall, Metropolis, Pike, Springfield, and Vienna.

#### 14. *KOLLA* Distant

*Kolla* Distant (1907, p. 223).

Fig. 122. Vertex subconically narrowed anteriorly, lateral margins in line with corresponding margins of eyes. Face with lateral areas somewhat strongly and transversely striate. Antennae long.

Two species are recorded in this genus

for the United States, and both occur in Illinois.

#### KEY TO SPECIES

Length at least 5.5 mm.; nervures of elytra broad and black.....1. *bifida*  
Length not exceeding 5.0 mm.; elytra dark green, without broad black nervures.....2. *geometrica*

#### 1. *Kolla bifida* (Say)

*Tettigonia bifida* Say (1831, p. 313).

*Tettigonia tenella* Walker (1851a, p. 770).

Fig. 133. Length 5.5–6.0 mm. Green, with white transverse bands on head and pronotum, nervures of elytra black. Vertex

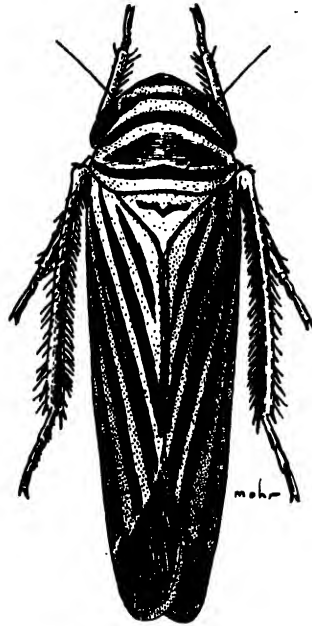


Fig. 133.—*Kolla bifida*.

bluntly conical, short, almost twice as wide as long, black; two white spots at apex, a transverse white band across disc, and another on posterior margin. Face black. Pronotum margined with a black band anteriorly, posterior margin white, with a black band just anterior to it; disc green. Elytra green, nervures black, apices smoky. Female seventh sternite with posterior margin roundedly produced at middle. Male plates short, triangular, apices slightly produced.

A common meadow and pasture species, especially abundant on coarse grasses in moist areas, *bifida* is distributed throughout

the eastern states and occurs as far west as Kansas and Nebraska.

**Illinois Records.**—Many males and females, taken June 14 to October 20, are from Aldridge, Algonquin, Alton, Apple River Canyon State Park, Carbondale, Cave in Rock, Channel Lake, Clay City, Dolson, Dongola, Dubois, Elizabethtown, Fern Cliff, Fountain Bluff, Grafton, Grand Detour, Grand Tower, Herod, Kampsville, Kankakee, Karnak, Lima, Metropolis, Mount Carmel, Muncie, Newton, Oak Lawn, Oakwood, Quincy, Rock Island, Savanna, Shawneetown, Urbana, Valley City, Vienna, Watson, and White Heath.

## 2. *Kolla geometrica* (Signoret)

*Tettigonia geometrica* Signoret (1854, p. 12).  
*Tettigonia psittacella* Fowler (1900, p. 290).

Length 4.5–5.0 mm. In general appearance similar to *bifida* but smaller; elytra without black nervures. Vertex black, marked with two apical spots and two transverse bright yellow bands as in *bifida*. Face black. Pronotum and scutellum marked as in *bifida*. Elytra bright green, nervures faintly black, apices smoky; each with three light spots anterior to smoky area and costal margin. Female seventh sternite with rounded posterior margin. Male plates short, triangular.

A common pasture and meadow species, especially in moist areas, *geometrica* is distributed in the southern states from the District of Columbia to Arkansas and Missouri.

**Illinois Records.**—Males and females, taken May 7 to September 24, are from Alto Pass, Dixon Springs, Dolson, Fern Cliff, Herod, Jonesboro, Karnak, Ozark, Rago, Urbana, and Vienna.

## 15. *HELOCHARA* Fitch

*Helochara* Fitch (1851, p. 56).

Fig. 131. Head wider than thorax, much broader than long, slightly and obtusely angled, and conical. The reflexed portion of the front elevated and prominent. Profile of face convex. Pronotum very long, hexangular, resembling the pronotum of *Aulacixes*; lateral margins short. Scutellum very small. Each elytron coriaceous, veins distinct, raised, with three anteapical and five apical cells.

Two species belonging to the genus are known in North America. One of them is

known only from California. The other is common throughout most of the United States.

### 1. *Helochara communis* Fitch

*Helochara communis* Fitch (1851, p. 56).  
*Tettigonia herbida* Walker (1851a, p. 769).

Length of female 6.0–7.0 mm.; male 4.0–5.5 mm. Usually dark green, but often pale green or yellowish, with a dark green stripe along claval suture. Eyes, ocelli, and concentric lines on reflexed portions of front dark. Male face black, female face green, marked with black arcs. The vertex is obtusely angled, blunt on margin, the reflexed portion of front prominent on vertex. Female seventh sternite with posterior margin slightly produced at middle. Male plates triangular, finger-like. Each antenna of male enlarged toward apex, fig. 131.

This is a very common species and probably the one taken most abundantly along stream margins, in low marshy grasses, or in wet meadows. It is transcontinental in distribution.

**Illinois Records.**—Many males and females, taken May 10 to October 17, are from Algonquin, Apple River Canyon State Park, Atlas, Beach, Cave in Rock, Fox Lake, Freeport, Fulton, Galena, Havana, Harvard, Momence, Mount Carmel, Oak Lawn, Oquawka, Palos Park, Princeton, Rock Island, Sheffield, Spring Grove, Sun Lake, Urbana, and Volo.

## 16. *CARNEOCEPHALA* Ball

*Carneocephala* Ball (1927, p. 39).

Fig. 125. Resembling *Draeculacephala* in general appearance and in the character of the reticulate apical portion of the elytra but differing by having the front inflated and conically rounded to the vertex. The vertex lacks the definite margin found in *Draeculacephala*; front mottled with tawny. Pronotum long, inclined to be hexangular.

Eight species are recorded by Nottingham (1932) and Knull (1940) as occurring in the United States; two of these occur in the East. Only one is known from Illinois.

### 1. *Carneocephala flaviceps* (Riley)

*Diedrocephala flaviceps* Riley (1880, p. 78).

Length of female 5.0–6.0 mm., male 4.5–5.0 mm. Dull greenish, elytra conspicuously

marked by white veins, apices pale gray or smoky, reticulate veined. Vertex bluntly angled, fulvous, marked with white. Pronotum yellowish anteriorly, disc green. Face fulvous tinted with pink. Female seventh sternite with a broad slightly produced median lobe. Male plates broad, gradually tapered to rather blunt apices, each bearing a finger-like process.

A common grass-feeding species, *flaviceps* occurs throughout the southern United States and is distributed from coast to coast. Although it is known in Illinois only in the southern part, there are records of its occurrence in Wisconsin.

**Illinois Records.**—CAVE IN ROCK: Oct. 2, 1934, Ross, 4♂, 2♀. DIXON SPRINGS: July 29, 1934, DeLong & Ross, 2♂, 1♀. HARRISBURG: at light, June 15, 1934, DeLong & Ross, 1♀; Aug. 3, 1934, DeLong & Ross, 1♂, 1♀. HORSESHOE LAKE: at light, July 10, 1933, Ross & DeLong, 2♂, 1♀. LAWRENCEVILLE: Sept. 7, 1933, Ross & Mohr, 1♀. METROPOLIS: Aug. 20, 1916, 2♂, 4♀. VIENNA: June 14, 1934, DeLong & Ross, 1♂, 3♀; Aug. 3, 1934, DeLong & Mohr, 2♂.

## 17. *GRAPHOCEPHALA* Van Duzee

*Graphocephala* Van Duzee (1916, p. 66).

Fig. 116. Head narrower than pronotum, eyes small, vertex almost flat, roundedly angled, apex obtusely rounded, margin sharp, acute, and dark lined. Front broad, appearing flat above in profile. Pronotum broadest across lateral angles, strongly curved in front, the side margins continuous with the curve of anterior margin. This genus contains some highly colored species that can be distinguished readily from the related *Ciminius* by the dark marginal band on the vertex.

Four species are known to occur in the United States; two of them are confined to the Southwest and two occur in the eastern states. One is northern and the other is southern in distribution, and both are found in Illinois.

### KEY TO SPECIES

- Vertex yellow, with a black band on anterior margin; length 8 mm. or more.....1. *coccinea*  
Vertex yellow, a black line just back of margin and parallel to it, and a pair of proximal longitudinal lines on disc; length 6 mm. or less.....2. *versuta*

## 1. *Graphocephala coccinea* (Forster)

*Cicada coccinea* Forster (1771, p. 69).

*Tettigonia quadri vittata* Say (1831, p. 312).

*Tettigonia picta* Walker (1851a, p. 758).

Length 8–9 mm. Pronotum and elytra red, marked with green longitudinal stripes; a broad median stripe on posterior portion of pronotum and a pair of oblique green stripes from the humeral angles. Elytra red; with claval suture, costal margin, a median stripe on corium, and the sutural margin before the middle of each green. Face and vertex yellow, a broad black band just beneath margin of vertex. Scutellum yellow. Female seventh sternite with posterior margin produced and rounded. Male plates long, concavely narrowed, attenuate, apices acute.

This is one of the largest, most conspicuously marked, and most common species of the North American leafhopper fauna. It usually occurs in abundance upon *Rubus* and is frequently found in all stages upon certain species of ornamental shrubs such as *Forsythia*. It often occurs in sufficient numbers to cause economic injury to ornamental plants. It is distributed throughout the eastern United States and occurs as far west as Texas and Oklahoma.

**Illinois Records.**—Many males and females, taken June 1 to October 21, are from Algonquin, Anna, Antioch, Apple River Canyon State Park, Atlas, Bluffs, Borton, Channel Lake, Chicago, Dixon, Dixon Springs, Dolson, Dubois, Eichorn, Elizabethtown, Galena, Galesburg, Golconda, Grafton, Grand Detour, Grandview, Grand Tower, Hardin, Harrisburg, Harvard, Havana, Herod, Homer, Justice, Kankakee, Keithsburg, Karnak, La Grange, Lawrenceville, Mahomet, Monticello, Mound City, Mount Carmel, Muncie, New Milford, Newton, Normal, Oakwood, Oregon, Palatine, Palos Park, Pulaski, Putnam, Quincy, Rock Island, Rosiclare, Savanna, Shawneetown, Starved Rock State Park, Temple Hill, Urbana, Vienna, Villa Ridge, Volo, Warren, Warsaw, Watson, Wauconda, White Heath, and White Pines Forest State Park.

## 2. *Graphocephala versuta* (Say)

*Tettigonia versuta* Say (1831, p. 311).

*Tettigonia redacta* Fowler (1900, p. 276).

Length 5–6 mm. Similar in color markings to *coccinea* but smaller in size. Vertex yellow, a black stripe on front just below

margin, a pair of median proximal black lines joined anteriorly with a pair of oblique black lines, which are almost parallel with anterior margins. Pronotum yellow at apex and along sides, and green posteriorly. Scutellum yellow or reddish, with black longitudinal lines. Elytron green or blue, a red stripe on either side of a blue stripe on claval suture; apical margin and posterior portion of costa pale yellow, with dark spots around apex. Female seventh sternite with posterior margin angularly produced, concave laterally. Male plates concavely narrowed to pointed apices, which are dark at tips and slightly turned up.

This species is especially abundant in the southern United States and occurs in southern Illinois and as far west as Texas. It is usually found in grassy and other types of herbaceous vegetation.

**Illinois Records.**—Many males and females, taken May 7 to November 13, are from Alto Pass, Anna, Anvil Rock, Borton, Browns, Cache, Carbondale, Carmi, Cave in Rock, Chester, Dixon Springs, Dongola, Dubois, Eichorn, Elizabethtown, Fountain Bluff, Gibsonia, Golconda, Grand Tower, Harrisburg, Herod, High Knob, Homer, Jonesboro, Karbers Ridge, Karnak, Makanda, Marshall, Metropolis, Mount Carmel, Norris City, Pounds, Pulaski, Quincy, Rosiclare, Shawneetown, Thebes, Urbana, Valley City, Vienna, Villa Ridge, Watson, Wichert, and White Heath.

### 18. *PLESIOMMATA* Provancher

*Plesiommata* Provancher (1889, p. 263).

Fig. 119. Slender, elongate in form. Vertex strongly produced and bluntly angled, more than two-thirds as long as basal width between eyes. Ocelli equidistant between posterior and lateral margins of vertex. Dorsal surface of vertex not deflexed, anterior portion gently rounded to apex and bluntly angled with front.

Only two species are known in this genus. One is recorded from Arizona. The other, *tripunctata*, is eastern in distribution. It was described as belonging to *Tettigonia* by Fitch (1851) and referred to *Kolla* by Van Duzee (1912). Van Duzee (1917) placed it in *Pagaronia*, a genus of larger western species. Oman (1938b), in a revision of the tribe Errhomenellini, placed it in *Plesiommata*, a genus erected for it when it was redescribed by Provancher.

### 1. *Plesiommata tripunctata* (Fitch)

*Tettigonia tripunctata* Fitch (1851, p. 55).  
*Plesiommata biundulata* Provancher (1889, p. 263).

Length 5 mm. White, marked with dark brown or black. Vertex conically pointed, with three black spots, one at apex and one enclosing each ocellus. Reflexed portion of face often marked with brown arcs. Margins of pronotum with brown lines, two transverse bands on disc. Elytral margins, nervures, and claval sutures with narrow brown lines. Posterior margin of female seventh sternite truncate or slightly rounded. Male plates broad at base, triangular, apices produced, forming attenuate tips.

A common species in open wooded areas on *Muhlenbergia* and similar herbaceous plants, *tripunctata* is distributed throughout the eastern United States and as far west as Missouri.

**Illinois Records.**—Males and females, taken February 1 to October 16, are from Aldridge, Apple River Canyon State Park, Dolson, Grand Tower, Herod, Normal, Thomson, Urbana, Vienna, and White Heath.

### 19. *DRAECULACEPHALA* Ball

*Draeculacephala* Ball (1901, p. 66).

Fig. 124. Vertex triangularly produced, bluntly pointed, frequently depressed just back of apex of vertex and flat or concave on anterior discal portion. Pronotum equaling width of head or narrower. Elytra long, narrowed apically, greenish, nervures raised, often paler, the apical and anteapical cells irregularly reticulate veined. The vertex anterior portion of pronotum, and scutellum are usually a shade of yellow, and the disc of pronotum and the elytra are dark green. All the members of this genus are similar in color pattern.

These leafhoppers are found in meadows, marshes, and swamps and occur on grasses and sedges, usually in abundance. Fourteen species have been recorded for North America in the various revisions of Van Duzee (1915a), Ball (1927), and Ball & China (1933). Nine forms have been collected in Illinois.

#### KEY TO SPECIES

1. Anterior portion of pronotum with black or brown vermiculate markings. . . . . 2
- Anterior portion of pronotum pale yellow

- or green, without definite dark vermiculate markings. . . . . 3
2. Markings on vertex and pronotum black, prominent; males not exceeding 6 mm., females not exceeding 8 mm. in length. . . . . 1. *inscripta*
- Markings on vertex and pronotum usually brownish, not prominent; males at least 8 mm., females at least 10 mm. in length. . . . . 6. *portola* var. *paludosa*
3. Vertex short in males; apex blunt, rounded margin thickened anteriorly; conspicuous black spots at apex and next to eyes. . . . . 4
- Vertex usually more angularly produced and acute; dark spots at apex small or faint, lines on vertex faint or narrow. . . . . 5
4. Male with a pair of black spots at apex of vertex and a spot just back of apex on meson. Female with vertex one-fourth wider than long, markings often faint. . . . . 2. *prasina*
- Male with a pair of black spots at apex and a spot next to each eye; median spot absent. Female with vertex almost as long as basal width, markings usually dark, conspicuous. . . . . 3. *angulifera*
5. Females. . . . . 6
- Males. . . . . 8
6. Length 9.0–10.0 mm. . . . . 7
- Length 7.5–8.0 mm. . . . . 8. *constricta* and 7. *mollipes*
7. Length 10 mm.; vertex about as long as basal width between eyes. . . . . 5. *portola* and 4. *producta*
- Length 9 mm.; vertex decidedly longer than basal width between eyes. . . . . 9. *antica*
8. Aedeagus with the ventral process of the dorsoposterior portion abruptly rounded from narrow basal stalk to form a rounded apical portion, as in figs. 148, 150. . . . . 9
- Ventral process not abruptly widened, more sloping, narrower and more elongate, as in fig. 143. . . . . 10
9. Aedeagus, fig. 148, with terminal portion as wide as long and subangulate on the sides near neck. . . . . 5. *portola*
- Aedeagus, fig. 150, with terminal portion longer than wide and nearly evenly rounded on sides between neck and apex. . . . . 4. *producta*
10. Apex of ventral process, fig. 143, narrowed and bluntly angled. . . . . 7. *mollipes*
- Apex of ventral process rounded and notched, as in figs. 147, 149. . . . . 11
11. Ventral process, fig. 149, appearing in ventral view narrowly notched either side near base, gradually widened from notch to apex, which is broadly rounded either side of a deep notch; long slender processes from ventroanterior portion straight, not curved at apex. . . . . 9. *antica*
- Ventral process, fig. 147, broadly, concavely rounded either side at base, widened on apical half, broadly rounded at apex, with a slight median notch; long slender processes from ventroanterior portion curved dorsally at apex. . . . . 8. *constricta*

# 1. *Draeculacephala inscripta* Van Duzee

*Draeculacephala inscripta* Van Duzee (1915a, p. 180).

Length of female 8 mm., male 6 mm. Short headed, with prominent black markings on vertex and anterior portion of pronotum. Vertex bluntly pointed, in both sexes decidedly wider between eyes than median length. Scutellum and anterior portion of pronotum yellow; disc of pronotum and elytra dark green; vertex with three broad curved black arcs between each eye and apex, a median black longitudinal line, a black oblique line anterior to median longitudinal line, a black oblique line anterior to and another posterior to ocellus, and a black spot between ocellus and eye. Pronotum one-fourth longer than vertex. Anterior portion marked with heavy black vermiculate lines. Scutellum with two round black spots on anterior portion of disc.

Posterior margin of female seventh sternite produced at median one-fourth with apex rounded, then concavely rounded on each side. Male plates rather long, triangular, gradually narrowed to rounded and up-turned apices. Styles, fig. 144, elongate, each broad near base, narrowed toward apex, with apical fifth bent inward, sloping to pointed apex, which is turned upward. The ventroanterior part of aedeagus bears two pairs of processes; the dorsal pair medium in length and heavy, the ventral pair slender and long, almost enclosing remainder of aedeagus. The dorsoposterior portion also bears a pair of dorsally directed processes at base, and a ventral portion, which is about one-third as wide as long (in ventral view), narrow at base for about one-fourth its length, then rapidly broadened and rounded to a blunt produced apex. Pygofer as in fig. 136A.

This species is distributed throughout the southeastern states and has been found in southern Ohio and southern Illinois.

Illinois Records.—KARNAK: Aug. 8, 1934, Ross, DeLong, & Mohr, 2 ♀. NORRIS CITY: on *Jussiaea diffusa*, Sept. 9, 1933, Ross & Mohr, 12 ♂; 12 ♀.

# 2. *Draeculacephala prasina* (Walker)

*Tettigonia prasina* Walker (1851a, p. 768).  
*Aulacixes noveboracensis* Fitch (1851, p. 56).

Length 8.0–8.5 mm. Blunt headed, with a pair of heavy black spots at apex of yellow vertex, and a black spot just in front of

each eye along margin, these spots usually larger in male than in female. Pronotum with anterior margin yellow, posterior portion dark green. Scutellum yellow, elytra green. Vertex bluntly angled, in male one-third wider between eyes than median length and decidedly shorter than pronotum. In female one-fourth wider between eyes than median length and about as long as pronotum.

Female seventh sternite long, with rather prominent lateral angles, between which the posterior margin is concavely rounded either side of a median produced apical fourth, the latter blunt at apex. Male plates appearing rather short and triangular, but each with blunt rounded upturned apex. Styles, fig. 145, long and narrow, each with the apical half curved dorsally and then caudally and sharp pointed at apex; ventroanterior portion of aedeagus with a pair of dorsally directed divergent processes and a pair of ventral processes that are curved outward, dorsally, and then caudally, enclosing the dorsoposterior portion of the aedeagus; the latter portion with a pair of dorsally directed processes and a ventral portion. The ventral portion is short and bears a pair of apical processes that are directed basad and are almost as long as the portion to which they are attached. Pygofer as in fig. 138A.

This is a common transcontinental species and is found in the United States from coast to coast.

**Illinois Records.**—Males and females, taken May 14 to October 5, are from Algonquin, Alsip, Amboy, Antioch, Champaign, Des Plaines, Fox Lake, Grand Detour, Ingleside, Lake Villa, McHenry, Moline, Orangeville, Savanna, Sun Lake, Waterman, Wauconda, Waukegan, and Zion.

### 3. *Draeculacephala angulifera* (Walker)

*Tettigonia angulifera* Walker (1851a, p. 771).  
*Draeculacephala manitobiana* Ball (1901, p. 70).

Length of female 8.5 mm., male 7.5 mm. Large, yellow and green, with a short bluntly angled head and distinctive genitalia. Vertex in male distinctly wider between eyes at base than median length; in female slightly wider at base than median length. Vertex, anterior portion of pronotum; and scutellum yellow. Posterior half of pronotum and elytra dark green. Male with a black spot on either side of apex

of vertex from which arise four parallel marginal lines; large triangular black spot just back of apex, from the base of which a diagonal heavy black line extends to each ocellar suture; from each line a broad stripe branches, extends inside of ocellus; in female, spots on either side of apex are much smaller; four marginal parallel lines conspicuous; median brown line extends from near apex to base; the two oblique lines on each side are brown; the anterior line is anterior to the ocellus and the posterior line is mesad and posterior to the ocellus.

Female seventh sternite with posterior margin produced, sloping from lateral angles to form a bluntly angled apex, slightly excavated near the lateral angles on each side. Male plates triangular, each tapered from a rather broad base to a narrow pointed apex, and exceeded by pygofer, fig. 139A, which is almost twice as long as plate. The dorsoposterior portion of the aedeagus, fig. 146, with a pair of long processes arising at base; ventral process rather broad at base and bearing lateral spurs; process constricted near base and produced for two-thirds its length, then enlarged to form a terminal portion that bears a long process on each outer angle, which extends basally. The terminal portion is narrowed and blunt at apex.

This species ranges from Ontario and Manitoba to Colorado. It is rare in Illinois.

**Illinois Records.**—CEDAR LAKE: Aug. 6, 1906, 1 ♂, 2 ♀. CHAMPAIGN: at light, July 26, 1889, 1 ♂. LAKE VILLA: swamp, Aug. 9, 1906, 1 ♂, 4 ♀.

### 4. *Draeculacephala producta* (Walker)

*Tettigonia producta* Walker (1851a, p. 772).  
*Tettigonia acuta* Walker (1851a, p. 773).  
*Tettigonia minor* Walker (1851a, p. 772).  
*Draeculacephala cubana* Metcalf & Bruner (1936, p. 926).

Length of female 10 mm., male 7 mm. Large, resembling *mollipes* in coloration and general appearance but with distinctive male genitalia. Vertex bluntly and angularly produced, in male wider between eyes than median length and much shorter than pronotum; in female as long as basal width between eyes and as long as pronotum. Vertex, anterior portion of pronotum, and scutellum yellow, the remainder of dorsal surface dark green. The vertex marked with faint brownish lines.

Female seventh sternite with posterior margin strongly produced and concave either side of blunt apex. Male plates long and each concavely narrowed to blunt acute apex. Styles, fig. 150, short, rather broad, apical half of each curved inwardly with apex bent ventrally; aedeagus with ventro-anterior portion bearing a pair of short dorsally directed processes and a pair of long curved divergent spinelike structures that extend to apex of aedeagus, converge near apex, and have a tip bent dorsally; dorsoposterior portion also has a pair of thick dorsally directed processes and a ventral process that in ventral view is narrow at base, broadly rounded at middle, and has apex broadly curved; ventral process about two-thirds as wide as long. Pygofers as in fig. 142.

This is a common species in Illinois and is also known from California, Washington, Colorado, and Florida.

**Illinois Records.**—Many males and females, taken from May 7 to November 4, are from Algonquin, Anna, Antioch, Anvil Rock, Apple River Canyon State Park, Arlington Heights, Atlas, Belvidere, Bloomington, Cache, Cairo, Carbondale, Carlyle, Cave in Rock, Champaign, Danville, Decatur, Dixon, Dolson, Dubois, East Cape Girardeau, East St. Louis, Elizabeth, Elizabethtown, Evergreen Park, Fountain Bluff, Fox Lake, Fulton, Geff, Gibsonia, Golconda, Grafton, Grand Detour, Gulfport, Hamilton, Hardin, Harrisburg, Harvard, Havana, Herod, High Knob, Homer, Horseshoe Lake, Jonesboro, Kampsville, Kankakee, Karnak, Luther, Macomb, Makanda, Manteno, Marshall, McHenry, Metropolis, Momence, Mount Carmel, Muncie, New Holland, New Milford, Norris City, Oak Lawn, Oakwood, Ogden, Olive Branch, Oquawka, Orangeville, Palos Park, Parker, Parker City, Pike, Princeton, Pulaski, Putnam, Quincy, Rosiclare, St. Joseph, Savanna, Shawneetown, Springfield, Spring Valley, Starved Rock State Park, Texas City, Thomson, Urbana, Vienna, Villa Ridge, Volo, Waltersburg, Watson, White Pines Forest State Park, Wolf Lake, and Zion.

#### 5. *Draeculacephala portola* Ball

*Draeculacephala portola* Ball (1927, p. 35).

Length of female 9.5 mm., male 7.5 mm. In form and general appearance resembling

*producta* but with male genitalia different. Vertex rather well produced, in male as long at middle as basal width between eyes; in female a little longer at middle than basal width between eyes. Vertex, anterior half of pronotum, and scutellum yellow; vertex with a brown spot either side of apex, each spot merging with the inner of three parallel marginal brownish lines; median line and a pair of diagonal lines on disc brown; posterior half of pronotum dark green, elytra dark green with pale veins.

Female seventh sternite with posterior margin produced, gradually sloping from rounded lateral angles to form a broadly angled, bluntly pointed apex. Male plates long, narrow, triangular, exceeded in length by the pygofers. Aedeagus, fig. 148, similar to that of *producta* but having the ventral process of the dorsoposterior portion with the narrowed constricted neck portion longer, and expanded part beyond the narrowed portion more abruptly widened to form broad shoulders at the base, from which the sides slope to form the bluntly pointed apex; pygofers, as in fig. 137A, also broadly rounded and not constricted or narrowed before apices.

This species was described from Florida and is known from three localities in Illinois.

**Illinois Records.**—MUNCIE: cattail bog, April 7, 1937, D. T. Ries, 1 ♀. SPRING VALLEY: June 28, 1937, Ross & Burks, 1 ♀. URBANA: July 2, 1889, C. A. Hart, 1 ♀.

#### 6. *Draeculacephala portola* var. *paludosa* Ball & China

*Draeculacephala paludosa* Ball & China (1933, p. 3).

Length of female 10–11 mm., male 8 mm. In general form resembling the typical *portola* but a little larger and with irregular dark vermiculate markings on the yellow anterior one-third of the pronotum. Predominant color dark green, the vertex and scutellum yellow; dark lines on vertex prominent. Male genitalia as in *portola*, fig. 148.

This form is widely distributed from the East Coast to the West Coast and occurs upon the river bulrush, *Scirpus fluviatilis*, at the margin of fresh-water swamps and marshes.

**Illinois Record.**—BUDA: in swamp, July 12, 1937, Mohr & Burks, 1 ♀.



### 7. *Draeculacephala mollipes* (Say)

*Tettigonia mollipes* Say (1831, p. 312).

Length of female 7.5–8.0 mm., male 6.0 mm. Yellow and green, with acutely angled vertex and without conspicuous markings. Vertex produced, apex blunt, as long as or slightly longer than basal width and slightly longer than pronotum. Vertex, anterior portion of pronotum, and scutellum yellow, posterior portion of pronotum and elytra dark green. Vertex faintly marked with narrow brownish lines.

Female seventh sternite with posterior margin concavely and roundedly produced either side of a median produced rounded apex. Male plates long, each concavely tapered to a narrow rounded divergent apex. Styles, fig. 143, short, each rather broad at middle of apical portion, bent inwardly, and outer margin concavely rounded to pointed apex; ventroanterior portion of aedeagus with a pair of rather short thick dorsally directed processes and a pair of long spinelike ventral processes that diverge and extend caudally to tip of aedeagus, with their apices curved dorsally; dorsoposterior portion with a pair of dorsally divergent processes and a ventral process that in ventral view appears elongate, about one-third as wide as long, with narrow base and narrow bluntly pointed apex. Pygofers as in fig. 141*A*.

This is a widely distributed species throughout the United States.

**Illinois Records.**—Males and females, taken June 10 to October 6, are from Apple River Canyon State Park, Carmi, Dixon Springs, Dolson, Farina, Gulfport, Harrisburg, Herod, High Knob, Jonesboro, Karnak, Mount Carmel, Muncie, Norris City, Princeton, Shawneetown, Springfield, Temple Hill, Vienna, Watson, and White Heath.

### 8. *Draeculacephala constricta* Davidson & DeLong

*Draeculacephala constricta* Davidson & DeLong (1943, p. 193).

Fig. 134. Length of female 8.0 mm., male 6.5 mm. Resembling *mollipes* in size, form, and color but with distinctive male genitalia. Vertex produced and bluntly angled, in both sexes as long as basal width and slightly shorter than pronotum. Vertex, anterior portion of pronotum, and scutellum yellow,

vertex marked with faint brownish longitudinal lines. Posterior portion of pronotum and elytra dark green, veins paler.

Female seventh sternite produced at apex, bluntly pointed, and concave on either side

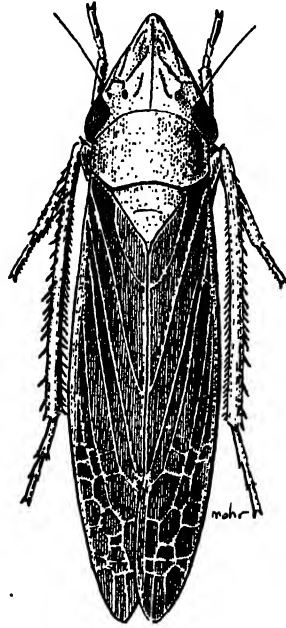


Fig. 134.—*Draeculacephala constricta*.

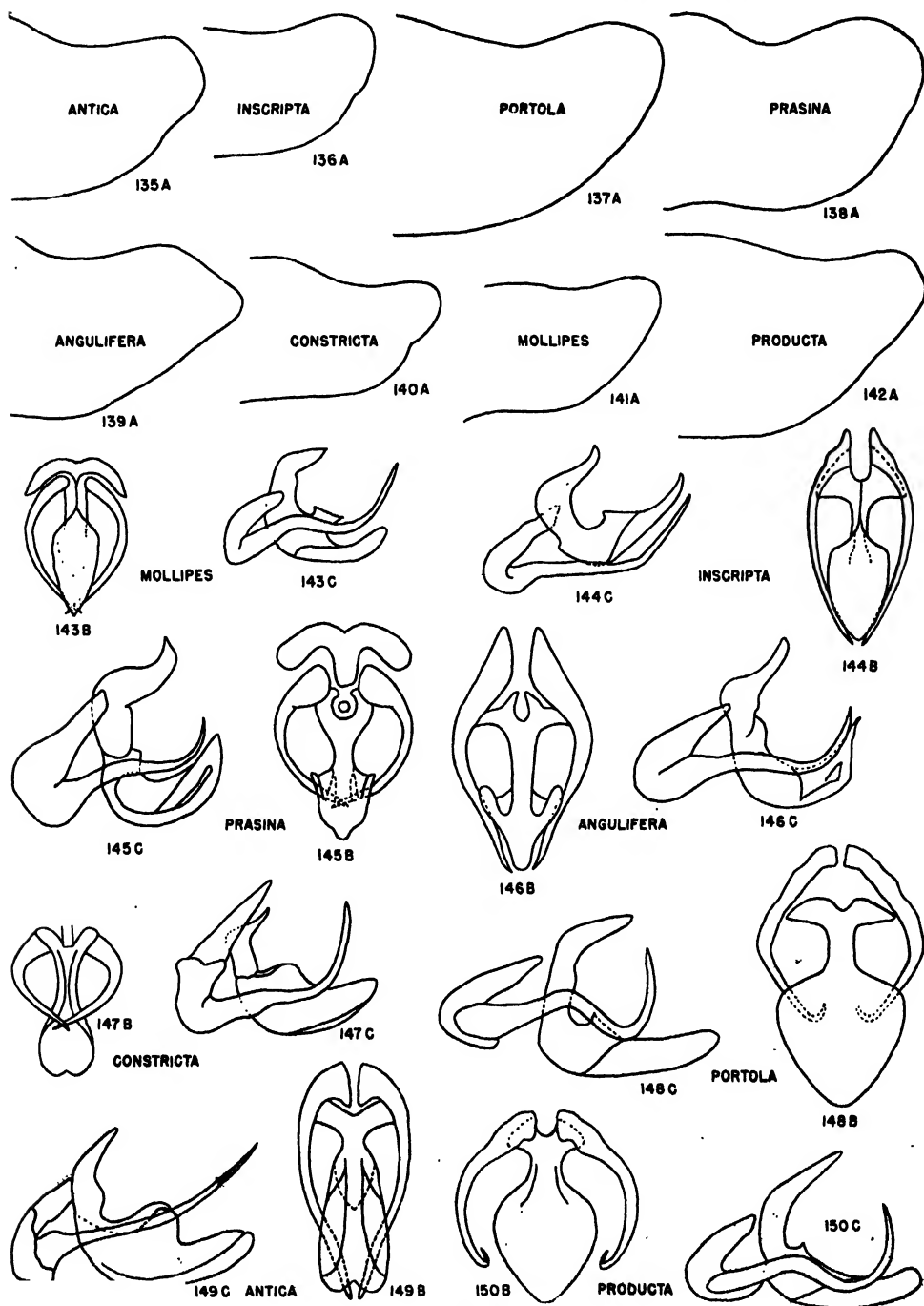
of apex. Male plates long, each reaching to tip of pygofer, concavely narrowed to acutely rounded apex. Styles, fig. 147, short, each broad at middle, apical portion bent inwardly, narrowed to pointed apex; ventroanterior portion of aedeagus with a pair of dorsally directed basal processes and a ventral pair of posteriorly directed divergent spinelike structures that extend almost to end of aedeagus and with apex that bends upward; dorsoposterior portion with a pair of dorsally directed processes and a ventral portion that is elongate, narrowed at base, convexly rounded in apical one-half and has apex broadly rounded; in lateral view ventral portion decidedly constricted just before base. Pygofers as in fig. 140*A*.

This species is found widely over the eastern and middle western states.

**Illinois Records.**—Many males and females, taken May 13 to November 3, are from Algonquin, Alton, Amboy, Anna, Antioch, Anvil Rock, Apple River Canyon State Park, Barry, Carbondale, Carmi, Cave in Rock, Champaign, Danville, Decatur, Dixon, Dixon Springs, Dolson, Dongola, Dubois,

Duncans Mills, Du Quoin, Evergreen Park, Fulton, Gibsonia, Grand Detour, Grand Tower, Grafton, Hanover, Havana, Homer, Kankakee, Kinmundy, Loda, Macomb, Marshall, McHenry, Metropolis, Monmouth,

Mount Carmel, Oak Lawn, Oakwood, Oquawka, Orangeville, Oregon, Parker, Pekin, Pike, Princeton, Pulaski, Putnam, Quincy, St. Anne, St. Joseph, Savanna, Seymour, Shawneetown, Sheffield, Springfield,



Figs. 135-150.—*Draeculacephala*, male genitalia. A, pygofer; B, ventral aspect; C, lateral aspect.

Starved Rock State Park, Taylorville, Thomson, Urbana, Vienna, Wauconda, Waukegan, Weldon Springs, White Pines Forest State Park, and Zion.

### 9. *Draeculacephala antica* (Walker)

*Tettigonia antica* Walker (1851a, p. 771).

Length of female 9 mm., male 7 mm. In general appearance resembling *mollipes* but with vertex more strongly produced and with distinctive male genitalia. Apex of vertex bluntly angled, in male slightly longer than basal width between eyes and as long as pronotum; in female decidedly longer than basal width between eyes and longer than pronotum. In color similar to *mollipes*; vertex yellow with faint brownish lines, anterior portion of pronotum and scutellum yellow, without markings.

Female seventh sternite with posterior margin concavely and roundedly produced to a median rounded produced apex. Male plates long, concavely rounded to acute rounded apices. Styles, fig. 149, rather short, apical half of each strongly sloping inwardly and narrowed to pointed apex that curves ventrally and slightly outwardly; ventroanterior portion of aedeagus with a pair of dorsally directed processes and a pair of ventral caudally directed spinelike structures that are as long as apex of aedeagus, divergent at base, converging near apex, and not bent dorsally; dorso-posterior portion with a basal pair of dorsally directed processes and a ventral portion that is narrow at base, broadened at middle, then tapered to a pair of blunt pointed processes at apex, this process elongate and about one-third as wide as long. Pygofers as in fig. 135A.

This species is found abundantly in the eastern United States.

**Illinois Records.**—Many males and females, taken May 4 to September 18, are from Adair, Albion, Amboy, Apple River Canyon State Park, Cache, Carbondale, Cary, Cave in Rock, Champaign, Des Plaines, Dixon, Dixon Springs, Dolson, Dongola, Elizabethtown, Fern Cliff, Fox Lake, Fulton, Grand Detour, Grand Tower, Havana, Herod, Homer, Jonesboro, Kankakee, Karnak, Litchfield, Monticello, Muncie, Normal, Oakwood, Oquawka, Pike, Princeton, Pulaski, Rago, St. Joseph, Taylorville, Thebes, Urbana, Vienna, Villa Ridge, Volo, Warren, and Wolf Lake.

### 20. *NEOKOLLA* Melichar

*Neokolla* Melichar (1926, p. 343).

Fig. 31. Head bluntly conical, slightly sloping, eyes and ledge over antennal sockets not prominent. Both front and vertex convex, merging without a perceptible margin separating them. Pronotum broadest at lateral angles. Elytra covering the tergum of abdomen.

Most species of *Neokolla* are known from the West or Southwest only. One is recorded from Quebec only. Two of the three eastern species are known to occur in Illinois. The other, a widely distributed species, may at some time be found in the southern part of the state.

#### KEY TO SPECIES

Black bars or lines, if present, on posterior portion of vertex, transverse; scutellum marked with black. . . . . 1. *hieroglyphica*  
Black lines on posterior margin of vertex longitudinal; scutellum faintly marked. . . . . 2. *gothica*

#### 1. *Neokolla hieroglyphica* (Say)

*Tettigonia hieroglyphica* Say (1831, p. 313).

Length 5.0–6.5 mm. This species varies in color from pale green and red to mostly black. The black form has been described as the variety *dolobrata* (Ball) (1901, p. 52), but some intergrades appear to connect the extremes. The lighter colored forms are blunt headed, stout, greenish through red to grayish, and with a black spot on apex of vertex; spot encircled by white; two divergent lines before middle not meeting at center; ocelli and a circle either side of disc at base black. Pronotum pale anteriorly, darker posteriorly, with light markings. Elytra slate, nervures darker. The darker variety is slightly smaller than typical *hieroglyphica*, shiny black in color except for margins of clypeus, genae, a line below the lateral margin of pronotum, circle around apex of vertex, line against each eye, and center of scutellum, which are white. Central line on vertex and line from this to either eye white; claval sutures of elytra light margined.

Female seventh sternite more than twice as long as sixth sternite; posterior margin triangularly produced, apex rounded. Male plates long, triangular.

This is a common willow species, and is especially abundant along the Illinois and

Mississippi rivers. The light and dark forms occur together in most collections.

**Illinois Records.**—Many males and females, taken March 29 to November 22, are from Adair, Alto Pass, Alton, Amboy, Anna, Ashley, Barry, Beardstown, Carbondale, Cave in Rock, Collinsville, Decatur, Dixon Springs, Dubois, East St. Louis, Eichorn, Elizabethtown, Fountain Bluff, Fulton, Geff, Grafton, Grand Tower, Greenville, Golconda, Hardin, Havana, Herod, Jonesboro, Kampsville, Karnak, Litchfield, Luther, Macomb, Mattoon, McHenry, Meredosia, Metropolis, Monticello, Neoga, New Columbia, Niota, Normal, Onarga, Oquawka, Pike, Princeton, Putnam, Quincy, Rockford, Rock Island, Rosiclare, St. Anne, Seymour, Shawneetown, Sheffield, Urbana, Vienna, Watson, West Union, White Heath, and White Pines Forest State Park.

## 2. *Neokolla gothica* (Signoret)

*Tettigonia gothica* Signoret (1854, p. 345).

Length 5.5–6.0 mm. Resembling *hieroglyphica* and often confused with it. Slightly smaller, vertex marked with several lines, which appear almost parallel. Vertex slightly conical, margins rounded, reddish or greenish yellow; apex black, surrounded by a pale circle; margins of reflexed portions, a line from this to ocellus, and a loop from the base either side light. Areas within these lines black. Scutellum light with dark markings. Elytra dirty green, nervures light. Female seventh sternite with posterior margin triangularly produced. Male plates long triangular.

This is a very common species in cut-over areas composed of shrubs and luxuriant growth of herbaceous vegetation. It is distributed throughout the eastern United States, and occurs as far west as Kansas and Texas.

**Illinois Records.**—Many males and females, taken March 29 to November 27, are from Aldridge, Alton, Alto Pass, Apple River Canyon State Park, Ashley, Bluffs, Champaign, Dixon Springs, Dolson, Dongola, Dubois, Elizabethtown, Galena, Grand Tower, Hardin, Havana, Herod, Mahomet, Marshall, Metropolis, Muncie, Murphysboro, Oakwood, Oliver, Oregon, Palos Park, Parker, Pike, Pounds, Quincy, Rock Island, Savanna, Urbana, Warren, Watson, White Heath, and White Pines Forest State Park.

## 21. *SIBOVIA* China

*Sibovia* China (1927, p. 283).

Fig. 118. Vertex blunt, with margins convex from eye to apex. Antennae at least half as long as body. Head and pronotum with a median and two pairs of narrow diagonal dark stripes.

One species in this genus is recorded for the United States.

### 1. *Sibovia occatoria* (Say)

*Tettigonia occatoria* Say (1831, p. 311).

*Tettigonia compta* Fowler (1900, p. 271).

Length 6 mm. Long and narrow, yellow, marked with black longitudinal lines. Vertex flat, bluntly angled, as long as basal width; yellow, a black spot at apex below the margin; a black stripe arising above and on either side of this spot and extending across vertex and pronotum, and a pair of black stripes inside and parallel to them meeting on anterior part of pronotum. A median dark brown line arising at base of vertex and extending to apex of scutellum. Elytra yellow, each marked with three black stripes on corium and three on clavus; apex black. Female seventh sternite with posterior margin obtusely rounded. Male plates short, rather broad, triangular, apices somewhat produced.

This species occurs on herbaceous vegetation in areas where luxuriant growth is found. It is known to occur from North Carolina and Florida to Texas and may eventually be collected in southern Illinois.

### Subfamily EVACANTHINAE

This group is characterized by having the ocelli just above anterior margin of vertex, and a median longitudinal carina on the face and vertex. Another carina extends from the inner margin of eye to the middle of anterior margin of vertex.

Only one genus, *Evacanthus* Le Peletier & Serville, belongs in this subfamily.

## 22. *EVACANTHUS* Le Peletier & Serville

*Evacanthus* Le Peletier & Serville (1825, p. 612).

Fig. 30. Head short and broad, vertex blunt, wider between eyes than median length, with a central longitudinal keel and a branch of keel each side from apex to eye.

Ocelli just above marginal keel and proximal to margin and not close to eyes. Front inflated, longitudinally carinate. Elytra without antepical cells.

Only two species of the genus are known to occur in North America. One is confined to certain regions of the southeastern states, and the other occurs in Canada and across the northern portions of the United States.

### 1. *Evacanthus acuminatus* (Fabricius)

*Cicada acuminata* Fabricius (1794, p. 36).

*Cicada interstincta* Fallen (1826, p. 29).

*Amblycephalus germari* Curtis (1833, p. 192).

*Evacanthus orbitalis* Fitch (1851, p. 57).

Fig. 151. Length 5.5–6.5 mm. Robust, with very blunt head and rather short elytra. Abdomen in female extending beyond apex

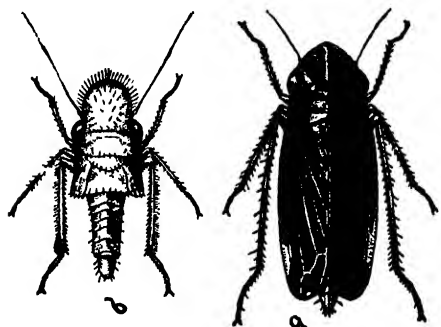


Fig. 151.—*Evacanthus acuminatus*: a, adult; b, nymph. (From Osborn.)

of elytra. Vertex with a median carina and also a carina extending from apex to either eye. Pronotum short, pubescent. Face and venter black. Female mostly testaceous on vertex and pronotum. Vertex with two black spots on disc and a row of spots on anterior portion of pronotum. Scutellum with two spots on disc. Elytra black or dark brown, with white stripes. Pubescence along nervures sparse. Female seventh sternite truncate or slightly sinuate. Male plates very long and slender, curved dorsally.

This species has been found on herbaceous vegetation in moist woodlands in the fern association.

Illinois Record.—URBANA: June 13, 1889, Hart, 1 ♂.

### Subfamily PENTHIMIINAE

The short ovate body with distinctly depressed vertex and broadly overlapping fore-

wings at the apex characterize members of this group.

One genus only, *Penthimia*, belongs to this subfamily.

### 23. *PENTHIMIA* Germar

*Penthimia* Germar (1821, pp. 38, 46).

Fig. 152. Short, broad, ovate, well rounded anteriorly and posteriorly. Vertex broad, short, broadly rounded. Head, including eyes, narrower than pronotum. Pronotum rather long, distinctly and transversely striate. Body broad, very short, elytra exceeding abdomen in length; slightly more than twice as long as wide, apex of each clavus truncate, appendix broad.

Lawson (1933) records two species for the United States. One of them is known only from Florida. The other occurs in the northern United States and is distributed through the East and westward to Colorado.

### 1. *Penthimia americana* Fitch

*Penthimia americana* Fitch (1851, p. 57).

*Penthimia vicaria* Walker (1851a, p. 841).

*Penthimia picta* Provancher (1872, p. 352).

Fig. 152. Length 5–6 mm. Short, broadly oval, in general appearance resembling a cercopid, reddish brown to black in color, with minute brown spots. Female seventh sternite slightly notched either side on posterior margin, forming a median lobe. Male plates broad, triangular.

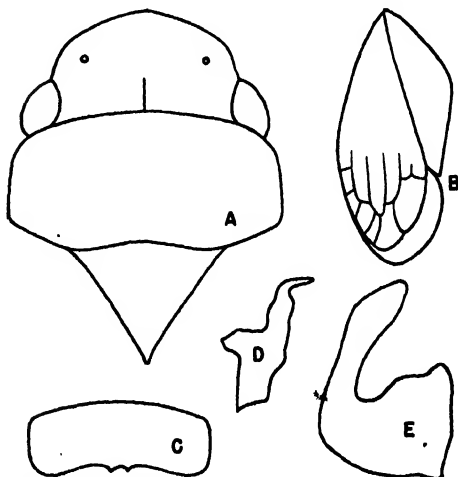


Fig. 152.—*Penthimia americana*. A, head and pronotum; B, elytron; C, female seventh sternite; D, E, male genitalia.

This species is widely distributed but not abundant and seems to be associated with shrubs in wooded and cut-over areas. It has frequently been taken from oak.

**Illinois Records.**—DUBOIS: May 21, 1917, 1♂; Aug. 10, 1917, 4♂. MAHOMET: June 30, 1912, 1♀. MEREDOSIA: May 29, 1917, 1 nymph. MUNCIE: May 27, 1905, 1♀. NORTHERN ILLINOIS: June, 1♀. OREGON: June 21, 1917, 1♀. SAVANNA: June 11, 1917, 1♀; June 12, 1917, 1♂. URBANA: in woods, May 7, 1888, 1♀; May 27, 1890, Hart, 1♀.

### Subfamily GYPONINAE

The members of this group are elongate, dorsoventrally flattened, and with ocelli on disc of vertex. Hind wings each with four apical cells.

This subfamily was monographed by DeLong (1942). Representatives of 5 of the 11 genera now recognized as belonging to this subfamily occur in Illinois. The other genera are chiefly southwestern.

### KEY TO GENERA

1. Elytra with numerous reticulate veins, at least on apical portions.....2  
Elytra without numerous reticulate veins.....3
2. Elytra rugose or roughened, often with white mottling; vertex and pronotum usually rugose.....26. *Rugosana*  
Elytra with venation often prominent but not rugose or roughened; vertex and pronotum never rugose.....
3. Vertex angled with front, margin thin, sharp, or foliaceous.....4  
Margin of vertex thick, not foliaceous.....
4. Dorsal surface dull; head and pronotum peppered with small brown dots; vertex with three longitudinal furrows, the ocelli situated at an angle on the lateral ones; cells of elytra margined with small dots.....27. *Prairiana*  
Dorsal surface shiny and uniformly colored, or with head, pronotum, and scutellum darker than elytra; vertex without three distinct longitudinal furrows.....24. *Gypona*

### 24. *GYPONA* Germar

*Gypona* Germar (1821, p. 73).

Pronotum broader than vertex, and together usually sloping from posterior margin of pronotum to anterior margin of vertex, the latter with margin thin and foliaceous. Venation of elytra simple. The species of the genus frequently exhibit sexual dimorphism in size and color. Each of the females and the males, when light in color, usually has a round black dot on the pronotum behind each eye. The males are often black and the spots are obscured. The male styles are usually broadened on apical portions and truncate.

Eight species of this genus are recorded for the United States. One is known to occur in Illinois; the others are western or southwestern in distribution.

#### 1. *Gypona melanota* Spangberg

*Gypona melanota* Spangberg (1878b, p. 19).  
*Gypona dorsalis* Spangberg (1878b, p. 30).  
*Gypona bipunctulata* Woodworth (1887, p. 30).  
*Gypona nigra* Woodworth (1887, p. 31).

Fig. 153. Length of male 9.0 mm., female 11.5 mm. Broadly rounded vertex; sexual dimorphic coloration. Vertex twice as broad between eyes as median length. Pronotum much wider than vertex and more than twice as long. Female yellowish, with a small conspicuous black spot on each side

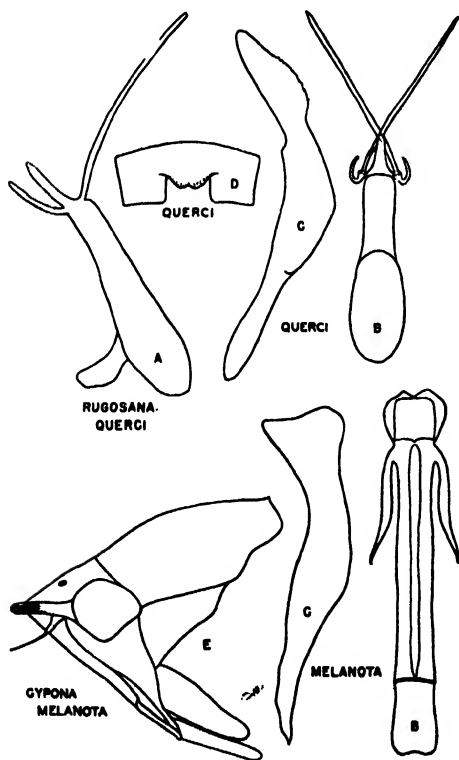


Fig. 153.—Gyponinae. A, lateral view of aedeagus; B, ventral view of aedeagus; C, style; D, female seventh sternite; E, head.

of outer disc of pronotum; elytra often greenish or appearing smoky. Male partially or entirely shiny black. The spots on pronotum conspicuous unless the entire pronotum is black.

Female seventh sternite broadly, angularly excavated from the produced lateral angles to form a rather broad shallow notch. Each male style somewhat narrowed between middle and broadened apical portion, which is broadly truncate on outer margin toward apex and rounded to apex on inner margin. Aedeagus broad, constricted before apex and produced and broadened to form an apical flap; just before the constriction a pair of lateral processes arise and extend basally for one-third the length of the body of the aedeagus.

This species is distributed from the New England states west to Colorado and Idaho. It occurs on low shrubs in cut-over areas and in open woodland.

**Illinois Records.**—CHAMPAIGN: July 27, 1892, Huckle, 1♀. OAK LAWN: July 27,

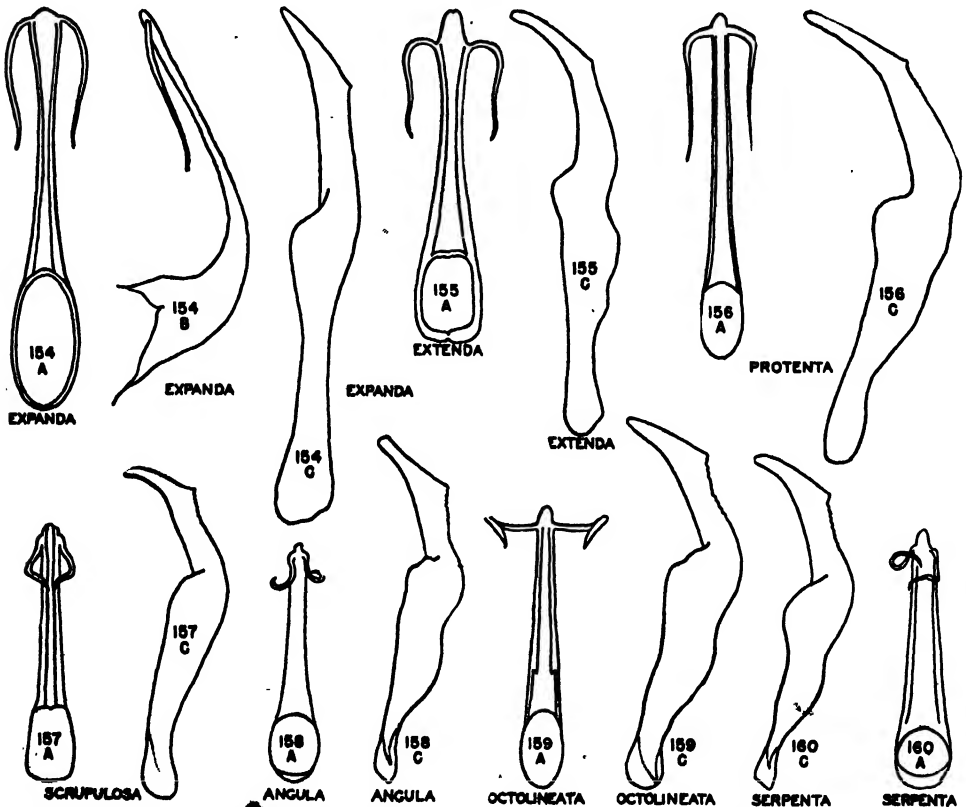
1934, DeLong & Ross, 3♂, 4♀; Sept. 6, 1935, Frison, 1♀. SAVOY: July 18, 1889, Hart, 1♂. SUMMIT: Aug. 21, 1935, DeLong & Ross, 1♀. TOLONO: July 25, 1895, 1♂.

## 25. *GYPONANA* Ball

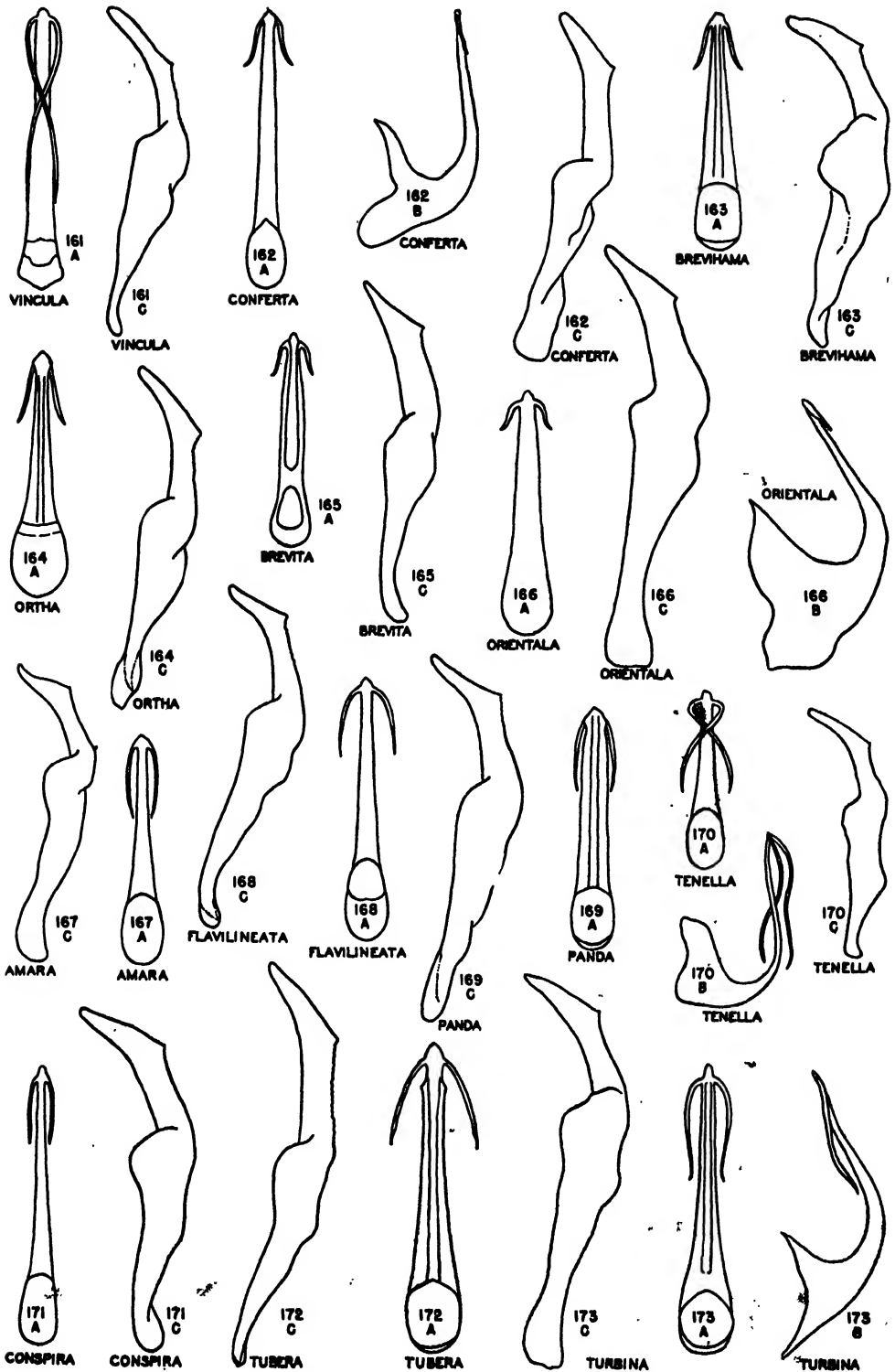
*Gyponana* Ball (1920, p. 84).

Closely related to *Gypona*. Vertex broad, flattened, and with the margin foliaceous and acutely angled with front. Pronotum broad, transverse, striated. Elytra rather long and narrow, with many irregular reticulations, especially on the apical portions.

Nearly 70 species of *Gyponana* have been recorded for the United States; of these, 19 species and a variety are known to occur in Illinois. With few exceptions they are similar in appearance. The males may be distinguished by characters of the internal genitalia, but no satisfactory characters have been found for separating the females.



Figs. 154-160.—*Gyponana*, male genitalia. A, ventral aspect of aedeagus; B, lateral aspect of aedeagus; C, style.



Figs. 161-173.—*Gyponana*, male genitalia. A, ventral aspect of aedeagus; B, lateral aspect of aedeagus; C, style.



## KEY TO SPECIES

1. Males.....2  
Females.....21
2. Aedeagus with rather short terminal processes, the apical halves of which are curved, twisted, or looped upon themselves as in figs. 157, 158.....3  
Aedeagus with terminal processes of various lengths, but usually not twisted or looped upon themselves, as in figs. 155, 165.....6
3. Apical portion of each style, fig. 157C, beyond the heel or spine rather narrow, almost parallel margined and curved anteriorly.....17. *scrupulosa*  
Apical portion of each style beyond the heel or spine broader and more gradually tapered to apex, as in figs. 158C, 159C.....4
4. Apical portion of each style, fig. 158C, appearing concave on both anterior and posterior portions beyond heel or spine.....20. *angula*  
Apical portion of each style appearing concave on anterior margin only, as in figs. 159C, 160C.....5
5. Anterior margin of apex of each style, fig. 159C, slightly concave.....18. *octolineata*  
Anterior margin more strongly concave, fig. 160C.....19. *octolineata* var. *serpenta*
6. Terminal processes of aedeagus one-fourth or less the length of shaft, as in fig. 165A.....7  
Terminal processes of aedeagus longer, one-third or more the length of aedeagus shaft, as in fig. 155A.....11
7. Terminal aedeagus processes less than one-fifth the length of shaft.....8  
Terminal aedeagus processes about one-fourth the length of shaft.....9
8. Each style, fig. 165C, slightly concave between spine and apex, the apex sharply pointed.....5. *brevita*  
Each style, fig. 166C, not concave between spine and apex, the apex more bluntly pointed.....6. *orientala*
9. Apical portion of each style, fig. 171C, broad at spine, tapered to one-third its width at apex.....8. *conspira*  
Apical portion of each style with blunt rounded apex, less strongly tapered to apex.....10
10. Apical portion of each style, fig. 163C, concavely curved anteriorly, convexly curved posteriorly between spine and apex.....3. *brevihama*  
Apical portion of each style, fig. 162C, almost straight on anterior and posterior margins between spine and apex.....2. *conferta*
11. Terminal aedeagus processes extending laterally, then curved at right angles and extending basally, as in fig. 155A.....12  
Terminal aedeagus processes curving basally from shaft, as in fig. 154A.....13
12. Aedeagus shaft, fig. 155A, broadened where terminal processes arise a short distance from apex; apical portion of style, fig. 155C, narrow and curved.....15. *extenda*  
Aedeagus shaft, fig. 156A, not widened at point where terminal processes arise; apical portion of each style, fig. 156C, straight and narrow.....16. *protenta*
13. Apex of aedeagus, fig. 154A, decidedly widened and broadly rounded.....14. *expanda*  
Apex of aedeagus not strongly widened.....14
14. Apex of each style bent caudally, fig. 167C.....11. *amara*  
Apex of each style not bent caudally.....15
15. Apical portion of each style narrow, as in fig. 169C, appearing almost parallel margined just before apex.....16  
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Processes of aedeagus less than half as long as aedeagus shaft.....19
18. Apical portion of each style, fig. 161C, narrow, gradually tapered to a blunt apex; tooth on ventral margin not prominent.....1. *vincula*  
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19. Aedeagus shaft, fig. 168, narrow, terminal processes convexly curved away from shaft; apical portion of each style, fig. 168, short, straight on posterior margin.....7. *flavilineata*  
Aedeagus shaft, fig. 164, broad at base, narrowed toward apex, terminal processes more concavely curved and closer to shaft; apical portion of each style longer, slightly and convexly rounded posteriorly.....4. *ortha*
20. Aedeagus shaft, fig. 172, narrowed just before point of origin of terminal processes; apical portion of each style tapered to blunt apex.....12. *tubera*  
Aedeagus shaft, fig. 173, not narrowed anterior to terminal processes; apical portion of each style narrowed to a sharper pointed apex.....13. *turbina*
21. Vertex about two-thirds as long at middle as basal width between the eyes.....7. *flavilineata*, 8. *conspira*, 9. *panda*, 12. *tubera*, 13. *turbina*, 15. *extenda*, 18. *octolineata*, 20. *angula*  
Vertex shorter, about one-half as long at middle as basal width between the eyes.....2. *conferta*, 3. *brevihama*, 4. *ortha*, 5. *brevita*, 11. *amara*, 13. *turbina*, 16. *protenta*, 17. *scrupulosa*, 19. *serpenta*

1. *Gyponana vincula* DeLong

*Gyponana vincula* DeLong (1942, p. 47).

Length 8–10 mm. Resembling *octolineata* in form and general appearance, but male with distinctive genitalia. Vertex roundedly produced, not quite twice as wide as median length. Pale yellow, mottled with orange. Each male style, fig. 161C, with apical third slender, curved gradually dorsally and about uniform in width throughout except for a pointed tooth on ventral margin about one-fifth the distance from the blunt rounded apex. Aedeagus, fig. 161A, tapered toward apex with a pair of long slender apical processes arising just before apex and extending more than two-thirds the distance toward base of aedeagus body.

The species is distributed from Connecticut and Pennsylvania west to Utah and Texas.

**Illinois Records.**—CHAMPAIGN: Sept. 30, 1892, Snow, 1 ♀. LONG LAKE: 1 ♂. QUINCY: Aug. 8, 1889, Hart, 1 ♀. SPRINGFIELD: July 6, 1885, 1 ♂. URBANA: sweeping in forest, June 27, 1889, Hart, 1 ♀; Sept. 3, 1890, Hart & Shiga, 1 ♀; Sept. 27, 1892, Snow, 1 ♀; Oct. 17, 1892, Snow & Marten, 1 ♀.

2. *Gyponana conferta* DeLong

*Gyponana conferta* DeLong (1942, p. 24).

Length 8.5–12.0 mm. Resembling *brevihama* but with vertex more broadly rounded and each style of male more narrowed on apical fifth. Vertex more than one-half as long at middle as width between eyes. Yellowish, with pruinose coloration on elytra. Male aedeagus, fig. 162, with a pair of short terminal processes that are directed basally and slightly laterally. Each style, fig. 162C, with a sharp pointed tooth produced on outer margin at about one-fifth the distance from apex; apical portion beyond tooth bent upward and gradually tapered to a rather bluntly rounded tip.

This species is known from only Illinois and Texas, but possibly is more widely distributed.

**Illinois Records.**—Many males and females, taken June 13 to November 12, are from Belvidere, Champaign, Eichorn, Elizabethtown, Golconda, Mahomet, Oakwood, Palos Park, Rock Island, St. Joseph, Seymour, Urbana, Western Springs, and Zion.

3. *Gyponana brevihama* DeLong

*Gyponana brevihama* DeLong (1942, p. 24).

Length 9.5 mm. Resembling *octolineata* in form and general appearance but male with distinctive genitalia. Vertex rather strongly and roundedly produced, about two-thirds as long as wide. Yellowish, with eight orange longitudinal lines on vertex, pronotum, and scutellum. Each male style, fig. 163C, with broad apical portion about twice as long as broad and slightly tapered to blunt rounded apex. Aedeagus, fig. 163A, with a pair of short slightly curved lateral processes that are directed basally; they are about one-fourth as long as the straight ventral portion of the aedeagus body beyond the curved base.

This species has been taken previously in Ohio, Pennsylvania, and Mississippi.

**Illinois Record.**—HAVANA: Devil's Rock, June 22, 1926, Frison & Hayes, 4 ♂.

4. *Gyponana ortha* DeLong

*Gyponana ortha* DeLong (1942, p. 25).

Length 9.5–10.5 mm. Resembling *octolineata* in form and appearance, but male with distinctive genitalia. Vertex strongly produced and appearing narrow, about two-thirds as wide as long. Yellowish; longitudinal lines on vertex and pronotum distinct, but rather faint. Each male style, fig. 164C, with apical third gradually curved dorsally; apical fourth abruptly bent and gradually narrowed to a bluntly curved apex. Aedeagus, fig. 164A, with a pair of rather short apical lateral processes that are about one-fourth the length of the ventral body of the aedeagus and are directed basally.

This species is widely distributed from Maryland west to Wisconsin and Kansas.

**Illinois Records.**—Males and females, taken June 5 to October 3, are from Clayton, Des Plaines, Fox Lake, Grantsburg, Hardin, Jacksonville, Quincy, Reynolds-ville, Springfield, Urbana, Villa Ridge, White Heath, and Wilmington.

5. *Gyponana brevita* DeLong

*Gyponana brevita* DeLong (1942, p. 27).

Length 9.5 mm. Resembling *octolineata* in form and appearance, with male genitalia distinctive. Vertex rather broadly rounded,

twice as wide as long. Yellowish, with pale irregular longitudinal stripes on the vertex, pronotum, and scutellum. Each male style, fig. 165C, gradually narrowed on apical sixth on ventral margin to a pointed apex. Aedeagus, fig. 165A, with a pair of lateral processes arising just before apex and extending laterally and then curved basally; processes about one-sixth the length of the ventral body of the aedeagus.

This species is known only from Illinois, Wisconsin, and Tennessee.

**Illinois Records.**—MACOMB: in pasture, July 3, 1934, DeLong & Ross, 1 ♂, 1 ♀ paratype. SAVANNA: July 19, 1892, Hart, Shiga, Forbes, & McElfresh, 1 ♂ paratype; July 27, 1892, Hart, Shiga, Forbes, & McElfresh, 1 ♂ paratype.

#### 6. *Gyponana orientala* DeLong

*Gyponana orientala* DeLong (1942, p. 26).

Length 10 mm. Resembling *octolineata* in color and general appearance, but male with distinctive genital structures. Vertex rather short and broad, almost twice as wide as long. Pale yellow, faintly marked with longitudinal orange bands on vertex, pronotum, and scutellum. Each male style, fig. 166C, with apical sixth gradually narrowed on ventral margin to a bluntly pointed apex. Aedeagus, fig. 166, with a pair of short lateral processes that arise just before apex, extend laterally and then curve basally.

This species has been collected in a few localities in the eastern United States and in Texas.

**Illinois Records.**—GALENA: July 10, 1934, DeLong & Ross, 1 ♂. MONTICELLO: June 11, 1934, Frison & DeLong, 3 ♂. WHITE HEATH: July 5, 1916, 2 ♂.

#### 7. *Gyponana flavilineata* (Fitch)

*Gypona flavilineata* Fitch (1851, p. 57).

Length 9.5–11.0 mm. Resembling *octolineata* in form and appearance. Vertex narrow, rather strongly produced and rounded, two-thirds as long as wide. Yellow; vertex, pronotum, and scutellum marked with orange-yellow longitudinal bands. Each male style, fig. 168C, with the apical third representing a foot with the bottom flat; heel abruptly bent on the ventral side, the dorsal margin curved and narrowed to the apex, which is curved to

outer margin. Aedeagus, fig. 168, narrowed to apex, where a pair of lateral curved processes extend laterally and then basally for more than one-fourth the distance to base.

This species ranges from Florida to Maryland and west to Utah and Texas.

**Illinois Records.**—Many males and females, taken June 5 to October 10, are from Albion, Apple River Canyon State Park, Beardstown, Byron, Cairo, Champaign, Danville, Eichorn, Geff, Gulfport, Havana, Harrisburg, Herod, Homan, Kampsville, Kankakee, Le Roy, Lima, Mokence, Monticello, Mount Carmel, Moweaqua, Norris City, Olive Branch, Omaha, Shawneetown, Siegel, Springfield, Urbana, Vandalia, Vienna, and White Pines Forest State Park.

#### 8. *Gyponana conspira* DeLong

*Gyponana conspira* DeLong (1942, p. 31).

Length 9.5–11.0 mm. Resembling *flavilineata* in general form and appearance, but with distinctive genitalia. Vertex roundedly produced, almost two-thirds as long at middle as basal width between the eyes. Pale yellowish; vertex, pronotum, and scutellum marked with longitudinal orange bands. Elytra yellowish subhyaline. Each male style, fig. 171C, slightly bent to form apical fourth, which is slightly widened on inner margin and then tapered to a bluntly rounded apex. Aedeagus, fig. 171, long, slender, with a pair of short lateral processes arising just before apex and extending basally one-fourth the length of the body of the aedeagus.

This species was described from Maine, Maryland, New York, and Illinois.

**Illinois Record.**—URBANA: June 30, 1891, Mitchell, 1 ♂.

#### 9. *Gyponana panda* DeLong

*Gyponana panda* DeLong (1942, p. 32).

Length 9.5–10.0 mm. Resembling *flavilineata* in form and general appearance, but male with distinctive genitalia. Vertex narrow, strongly produced, rounded at apex, two-thirds as long as wide. Pale, marked with orange longitudinal bands on vertex, pronotum, and scutellum. Each male style, fig. 169C, with apical fifth bent abruptly dorsad, outer margin concavely curved to

form an almost parallel-margined narrow finger-like process, which is curved caudad and is bluntly rounded at apex. Aedeagus, fig. 169, rather short and broad, with a pair of short appressed lateral processes arising just before apex and extending basally about one-third the length of the body of the aedeagus.

A widely distributed species in the Middle West and South, *panda* is also found in Oregon.

**Illinois Records.**—Many males and females, taken June 12 to November 15, are from Alton, Cobden, Dolson, Grand Tower, Havana, Homer, Kirkwood, Normal, Norris City, Oakwood, Oregon, Pike, Princeton, Quincy, Ripley, Savanna, Shawneetown, Sherman, Temple Hill, Urbana, and Watson.

#### 10. *Gyponana tenella* (Spangberg)

*Gypona tenella* Spangberg (1878b, p. 34).

Length 7–8 mm. Small, with a broadly rounded vertex. Vertex short, twice as wide as median length. General color pale green; vertex, pronotum, and scutellum marked with orange longitudinal bands. Veins of elytra inconspicuous. Each male style, fig. 170, narrowed on apical third, then curved dorsally with a pointed tooth on ventral margin about one-fourth the distance from the apex; gradually narrowed from this tooth to form a rather long narrow process, which is blunt and rounded at apex. Aedeagus rather narrow, with a pair of lateral processes arising just before apex; processes curved laterally and extended basally almost to base of ventral body of aedeagus.

This species has been previously recorded from the southeastern states only.

**Illinois Record.**—GRAND TOWER: July 12, 1909, 1 ♂.

#### 11. *Gyponana amara* DeLong

*Gyponana amara* DeLong (1942, p. 32).

Length 9.0–9.5 mm. Resembling *octolineata* in general appearance but with more produced vertex and with distinctive male genitalia. Vertex strongly and rather angularly produced, with apex rounded; more than half as long as middle as basal width between eyes. Pale yellow, conspicuously marked with bright orange longitudinal stripes on vertex, pronotum, and scutellum.

Elytra pale with darker veins. Each male style, fig. 167, with outer margin curved slightly outwardly on apical portion, tip curved caudadly, angularly widened on inner margin about one-sixth the distance from apex and then tapered to upturned blunt tip. Aedeagus narrowed toward apex, with a pair of rather short lateral processes arising just before apex and extending basally about one-third the length of body of aedeagus.

This species was described from Illinois, Missouri, and Ohio.

**Illinois Records.**—ANTIOCH: Aug. 24, 1935, DeLong & Ross, 2 ♂, 2 ♀ paratypes. ATLAS: July 28, 1936, Mohr & Burks, 1 ♀ paratype. CHICAGO: Aug. 21–24, 1901, Titus, 1 ♂. HEROD: June 24, 1936, DeLong & Ross, 1 ♀ paratype. MUNCIE: cattail bog, Sept. 10, 1936, Burks, 1 ♂ paratype. SHAWNEETOWN: June 27, 1936, DeLong & Mohr, 3 ♂, 9 ♀ paratypes. SPRINGFIELD: July 2, 1885, 1 ♂. URBANA: Oct. 11, 1938, Riegel, 1 ♂ paratype.

#### 12. *Gyponana tubera* DeLong

*Gyponana tubera* DeLong (1942, p. 33).

Length 9.5–10.5 mm. Resembling *flavilineata* in form and general appearance but with distinctive genitalia. Vertex roundedly produced, less than two-thirds as long at middle as width between the eyes. Pale yellow, marked with faint orange longitudinal bands on vertex, pronotum, and scutellum. Each male style, fig. 172, bent dorsally and caudad, and narrowed at one-fifth the distance from apex, gradually narrowed to rounded blunt apex. Aedeagus with a pair of lateral processes arising just before bluntly pointed apex, curved laterally and basally about one-third the distance to base; aedeagus body is constricted just basad to point of origin of the apical lateral processes.

This species is found in the eastern United States and is distributed west to Tennessee and South Dakota. In Illinois it is known from only the southern half.

**Illinois Records.**—DANVILLE: July 30, 1917, 1 ♂ paratype. HEROD: Aug. 4, 1934, DeLong & Mohr, 1 ♀; July 8–11, 1935, DeLong & Ross, 1 ♂; June 20, 1938, DeLong & Ross, 1 ♀. MAKANDA: Aug. 20, 1891, French, 1 ♂. ROSICLARE: July 5, 1935, Frison & Mohr, 1 ♂.

13. *Gyponana turbina* DeLong

*Gyponana turbina* DeLong (1942, p. 37).

Length 9.5–11.0 mm. Resembling *flavilineata* in form and appearance but with distinctive male genitalia. Vertex broadly rounded, produced at middle, almost twice as wide as long. Green, vertex mottled with orange yellow. Each male style, fig. 173, curved slightly dorsad, with a broad short tooth on ventral margin about one-sixth the distance from the apex, the style gradually narrowed from this tooth to a pointed apex. Aedeagus narrowed apically, with a pair of lateral processes arising just before apex; processes curving basally and extending along body of aedeagus one-third the distance to the base.

This species is widely distributed from the East Coast west to Texas and Utah.

**Illinois Records.**—Males and females, taken May 23 to September 20, are from Champaign, Cornfield, Dixon Springs, Fulton, Herod, Meredosia, Muncie, Sugar Grove, Urbana, Volo, and White Pines Forest State Park.

14. *Gyponana expanda* DeLong

*Gyponana expanda* DeLong (1942, p. 38).

Length 10.5 mm. Resembling *octolineata* in form and appearance but with head more produced and with distinctive male genitalia. Vertex produced and rather broadly rounded, almost two-thirds as long as basal width between the eyes; margin thin and slightly curved upwards. Pale, almost white, with orange longitudinal bands on vertex, pronotum, and scutellum. Elytra with green veins. Each male style, fig. 154, curved dorsally on apical sixth, where a short pointed tooth arises on ventral margin; beyond this the apical portion is gradually tapered to a bluntly pointed apex. Aedeagus constricted at middle, decidedly enlarged and broadly rounded at apex; a pair of lateral processes arising at apex, curving laterally, and then extending basally about one-third the distance to the base of aedeagus body.

This species is known only from Illinois, Missouri, and Ohio.

**Illinois Records.**—DIXON SPRINGS: June 24, 1936, DeLong & Ross, 1 ♂, 5 ♀ paratypes. HOMER PARK: July 19, 1924, Frison, 2 ♂ paratypes; at light, July 11, 1927, Frison & Glasgow, 1 ♀ paratype.

15. *Gyponana extenda* DeLong

*Gyponana extenda* DeLong (1942, p. 39).

Length 10–12 mm. Resembling *flavilineata* in form and general appearance but with distinctive male genitalia. Vertex strongly produced, apex rounded, almost three-fourths as long as wide. Pale yellow, marked with faint longitudinal orange bands on vertex, pronotum, and scutellum. Each male style, fig. 155, strongly curved dorsally on apical third, and bearing a short tooth on the ventral margin about one-sixth the distance from apex; beyond tooth, style narrow and almost parallel margined to blunt apex. Aedeagus constricted near middle and enlarged at apex; a pair of lateral processes arising a short distance before produced rounded apex, extending laterally, and then curving basally to a point about one-third the distance to the base.

This species is widely distributed over the eastern United States.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 1 ♂, 3 ♀ paratypes. DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 1 ♂, 2 ♀ paratypes. LA GRANGE: Aug. 23, 1935, DeLong & Ross, 2 ♂, 1 ♀ paratypes. OAKWOOD: Aug. 17, 1934, DeLong & Ross, 1 ♂ paratype. THEBES: July 29, 1909, 1 ♂ paratype; on cane, July 11, 1935, DeLong & Ross, 1 ♂ paratype.

16. *Gyponana protenta* DeLong

*Gyponana protenta* DeLong (1942, p. 41).

Length 9.5 mm. In general appearance resembling *acia* DeLong, but with vertex more strongly produced and with style long and narrow. Vertex roundedly produced, more than half as long at middle as basal width between eyes. Pronotum a little longer than vertex. Yellowish, vertex and pronotum with longitudinal orange bands. Elytra subhyaline, tinged with orange. Each style, fig. 156, with apical half gradually tapered to narrow rounded apex; outer margin angled one-fifth the distance from apex and bent upward; apical fifth narrow and fingerlike. Aedeagus with a pair of lateral terminal processes that extend laterally for a short distance, then curve and extend basally almost half the distance to base; they are tapered to fine pointed tips.

This species is known from Illinois and Ohio only.

**Illinois Records.**—GRAFTON: along river, June 26, 1934, DeLong & Ross, 1 ♂, 2 ♀. JUSTICE: July 23, 1937, Mohr & Burks, 1 ♂ paratype. MARSHALL: Sept. 27, 1934, 3 ♀. URBANA: June 21, 1936, Burks, 1 ♀ paratype; June 24–25, 1936, Riegel, 2 ♂ paratypes; Sept. 8, 1938, Riegel, 1 ♂ paratype; Sept. 10, 1938, Riegel 1 ♂ paratype; Sept. 14, 1938, Riegel, 1 ♂ paratype. WHITE PINES FOREST STATE PARK: Aug. 13–14, 1937, Ross & Burks, 1 ♂ paratype.

#### 17. *Gyponana scrupulosa* (Spangberg)

*Gypona scrupulosa* Spangberg (1878b, p. 9).

Length 9.0–9.75 mm. Yellowish, closely related to *octolineata*. Vertex rather short and broadly rounded, almost twice as wide as long, without definite markings. Each male style, fig. 157, with apical third rather broad to ventral tooth on basal portion; beyond this the apical one-sixth of style is narrow, produced dorsally, and curved anteriorly to a bluntly pointed apex. Aedeagus with a pair of short lateral processes arising just before apex and recurved inwardly.

This is a widely distributed and common eastern species ranging west to Wisconsin and Texas.

**Illinois Records.**—Males and females, taken June 20 to October 3, are from Algonquin, Alto Pass, Anna, Anvil Rock, Bluffs, Borton, Cave in Rock, Champaign, Clay City, Dubois, Du Quoin, East St. Louis, Elizabeth, Elizabethtown, Mason City, Metropolis, Normal, Pulaski, Putnam, Urbana, Warren, and Waukegan.

#### 18. *Gyponana octolineata* (Say)

*Tettigonia octolineata* Say (1825, p. 340).

*Gypona geminata* Osborn (1905b, p. 513).

Length 9–10 mm. Greenish to pale yellow, with eight reddish longitudinal lines on vertex and pronotum. Vertex produced and broadly rounded, about two-thirds as long at middle as basal width between eyes. Each male style, fig. 159, with apical one-sixth gradually narrowed from ventral tooth to a blunt apex; the caudal margin is straight and the apical portion does not curve anteriorly. Aedeagus with a pair of short lateral processes that arise just before apex and extend laterally, their apices recurved.

This species occurs in the eastern United States.

**Illinois Records.**—PHILLIPSTOWN: June 24, 1936, DeLong & Ross, 2 ♂. URBANA: June 21, 1936, B. D. Burks, 1 ♂; light trap, Sept. 5–9, 1938, G. T. Riegel, 3 ♂, 2 ♀.

#### 19. *Gyponana octolineata* var. *serpenta* DeLong

*Gyponana octolineata* var. *serpenta* DeLong (1942, p. 53).

Length 9–11 mm. Similar to *octolineata* in form and appearance but each style with a slightly curved apical portion. Vertex strongly produced, broadly rounded, a little more than half as long at middle as basal width between eyes. Pale yellow, vertex, pronotum, and scutellum marked with longitudinal orange bands. Each male style, fig. 160, with apical sixth gradually constricted to blunt apex and slightly curved anteriorly. Aedeagus rather broad, with a pair of short lateral processes that are curved strongly on apical portions.

A widely distributed and common variety in the eastern states, *serpenta* ranges west to Wyoming.

**Illinois Records.**—Males and females, taken June 11 to October 13, are from Alto Pass, Anna, Carbondale, Cave in Rock, Dongola, Dubois, Gibsonia, Kampsville, Long Lake, Oquawka, St. Anne, Sparta, Springfield, Urbana, Volo, Waukegan, and Woodworth.

#### 20. *Gyponana angula* DeLong

*Gyponana angula* DeLong (1942, p. 54).

Length 9–10 mm. Resembling *octolineata* in form and general appearance, male genitalia distinctive. Vertex roundedly produced, about two-thirds as long as wide. Yellowish, mottled with orange on vertex, pronotum, and scutellum, longitudinal bands usually distinct. Elytra often tinged with orange, veins pale green. Each male style, fig. 158, with apical sixth narrowed beyond ventral pointed tooth to form a narrow constricted portion just before a slightly enlarged rounded blunt apex. Aedeagus with a pair of short basally directed and apically curved processes.

This species is found in the eastern states and west as far as Texas. It is very rare in Illinois.

**Illinois Records.**—METROPOLIS: Aug. 19, 1916, 1 ♂ paratype. OMAHA: June 23, 1936, DeLong & Ross, 2 ♂.

## 26. *RUGOSANA* DeLong

*Rugosana* DeLong (1942, p. 64).

Related to and similar to *Gyponana* but with elytra rugose or roughened. Usually the vertex and pronotum are rugose also. The members of this genus may be distinguished from those of genera having a strong venation, in which the veins appear embossed. The rugose character in this genus is not caused by the condition of the veins, but by the venation of irregular reticulation which may tend to cause it to be more conspicuous. The vertex is flattened, depressed, and is strongly foliaceous. The pronotum bears a large round black spot about the middle behind each eye. The elytra are often so colored as to appear with many crossveins; apical portion has numerous crossveins.

This is a small genus of nine species, which are found chiefly in the Southwest, but the genus contains one widespread species that has been taken in Illinois.

### 1. *Rugosana querci* DeLong

*Rugosana querci* DeLong (1942, p. 69).

Fig. 153. Length 9–10 mm. Resembling *rugosa* (Spangberg) (1878b, p. 6), but with distinctive genitalia. Vertex produced and rather broadly rounded, almost twice as wide as long. Pale yellow, with traces of longitudinal orange bands on vertex, pronotum, and scutellum. Pronotum with a conspicuous round black spot on each side of outer margin of disc. Elytra pale, mottled with brownish yellow, causing a rugose appearance.

Female seventh sternite, fig. 153, almost truncate on posterior margin, median third abruptly excavated one-half the distance to the base, the excavation bearing a broad blunt rounded tooth slightly notched at middle and produced about one-third the depth of the excavation. Each male style, fig. 153, with basal third narrow and constricted at two-thirds its length, thus forming two convexly rounded ventral lobes, the apical one of which is serrate and extends to the broad bluntly rounded apex. Aedeagus, fig. 153, with an abruptly narrowed, prolonged, finger-like apical process at the base of which on either side arises a long slender process; each process crosses the one from the opposite side and extends apically the length of the body of the aedeagus.

A widely distributed eastern species, *querci* occurs as far west as Utah and Arizona. It is a common species on oak in the eastern and southern states.

Illinois Records:—ALGONQUIN: Aug. 25, 1897, 1 ♀ paratype. ASHLEY: Aug. 7, 1871, 1 ♀ paratype. DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 1 ♀ paratype. DUBOIS: Aug. 8, 1917, 2 ♂, 5 ♀ paratypes. HAVANA: Aug. 20, 1917, 1 ♀ paratype. MEREDOSIA: Aug. 19, 1917, 5 ♂, 11 ♀ paratypes. SAVANNA: July 27, 1892, McElfresh, Shiga, Forbes, & Hart, 1 ♀ paratype.

## 27. *PRAIRIANA* Ball

*Prairiana* Ball (1920, p. 90).

Related to and similar to *Rugosana*, but with eyes small and widely separated. Usually decidedly flattened and some shade of brown or black. Pronotum broad, flat, lateral margins almost straight. Vertex about as wide as pronotum, often elongate, and with thin foliaceous anterior margin. Elytra often shorter than abdomen. Ocelli on disc usually a little nearer median line than eyes.

Fifteen species and several varieties have been recorded for the United States. Two species and one variety are known to occur in Illinois.

### KEY TO SPECIES

Length more than 8 mm.; vertex broadly and angularly produced, apex rounded, more than two-thirds as long at middle as basal width between eyes.....2. *kansana*  
Length about 7 mm.; vertex more broadly rounded, slightly more than half as long as wide.....1. *cinerea*

### 1. *Prairiana cinerea* (Uhler)

*Gypona cinerea* Uhler (1877, p. 460).

Length 7–9 mm. Small, with a broadly rounded head. Vertex broadly rounded and produced, about one-third wider than long. Pale brown, with dark brown punctures. Vertex with a black spot each side on base of vertex half way between eye and median line. A spot on anterior portion of pronotum behind each spot on vertex. Veins of elytra margined with dark brown punctures and with scattered brownish spots. Female seventh sternite concavely rounded on posterior margin either side of a slightly produced median rounded lobe. Each male style gradually tapered on apical half to a

rather blunt slightly broadened apex. Aedeagus with dorsal portion deeply and concavely excavated on dorsal surface just before apex, which is produced to form long, dorsally curved, pointed processes; ventral portion curved back upon itself so that the apex is in the concavity of the dorsal portion.

This is a widespread middle western species found as far west as Colorado and Montana.

**Illinois Record.**—CHICAGO: (Glenview), June 5, 1912, 1 ♂.

## 2. *Prairiana kansana* Ball

*Prairiana cinerea* var. *kansana* Ball (1920, p. 91).

Length 9 mm. Broad, with a broad almost angularly produced vertex. Vertex about two-thirds as long at middle as basal width between eyes. Pale brown, vertex and pronotum heavily marked with brownish punctures. Veins of elytra faintly marked with brown. Female seventh sternite with produced lateral angles, between which the posterior margin is concavely excavated on either side of a median lobe; lobe rounded, produced, and slightly notched at apex. Male style similar to that of *cinerea*, concavely rounded, narrowed just before blunt apex, which is slightly enlarged. Aedeagus shallowly and concavely excavated just before dorsally curved sharply pointed apex, which extends dorsad.

This species, and its variety *angustens*, have been taken in the Middle West only.

**Illinois Record.**—HANOVER: sand prairie, July 10, 1934, DeLong & Ross, 1 ♂.

*Prairiana kansana* var. *angustens* DeLong

*Prairiana kansana* var. *angustens* DeLong (1942, p. 83).

Length 10.5 mm. Resembling *kansana* in general appearance, but more slender, elongate, and with vertex more pointed. Vertex about one-third wider between eyes than median length. Pale brown, tinged with white. Vertex and pronotum punctate with small brown spots. Elytra pale, faintly margined with brown. The male aedeagus and styles are similar to those of *kansana*.

**Illinois Records.**—EVERGREEN PARK: July 1, 1935, 1 specimen. URBANA: July 21, 1936, B. D. Burks, 4 ♂; July 25, 1934, Frison & DeLong, 1 ♂.

## 28. *PONANA* Ball

*Ponana* Ball (1920, p. 93).

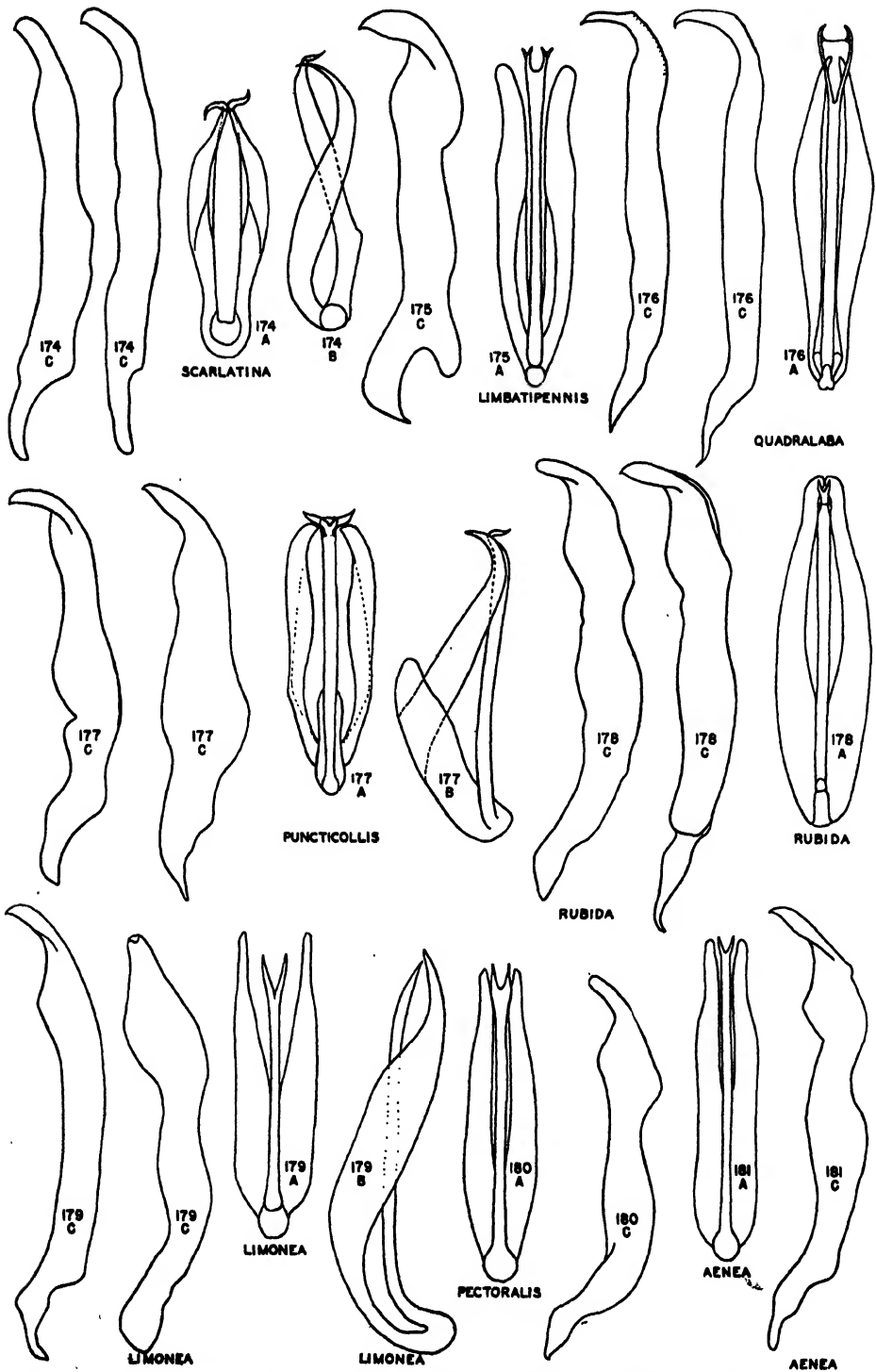
Fig. 22. Related to and similar to *Gypona*, but with body more convex and cylindrical in type. Pronotum conspicuously wider than vertex, transverse, striated, convexly sloping to vertex; lateral margins almost angled, laterally produced. Vertex usually convex or sloping, with a rather definite depression just before the thickened anterior margin, depression also indicated below margin; vertex and front meeting at nearly a right angle, front scarcely inflated. Ocelli rather large, on disc before middle.

The genus contains 22 species in the Nearctic region distributed over the eastern United States and the Southwest. Four of these species have been taken in Illinois, while several others may occur here.

### KEY TO SPECIES

1. Vertex and often pronotum marked with small reddish dots.....2  
Vertex and pronotum without reddish dots.....3
2. Vertex produced at middle; pronotum with two black spots on anterior margin, one behind each ocellus...1. *scarlatina*  
Vertex more broadly rounded; pronotum with four black spots on anterior margin, one behind each ocellus and one behind each eye.....2. *puncticollis*
3. Pronotum and elytra heavily punctate with small brown spots.....2. *puncticollis*  
Pronotum and elytra not marked with small brown spots.....4
4. Elytra uniformly dark brown to black, costae conspicuously yellow; vertex and pronotum pale, unmarked.....5. *limbatipennis*  
Elytra not uniformly dark in color.....5
5. Anterior portion of pronotum with four conspicuous spots.....7. *quadrilaba*  
Pronotum without definite dark markings on anterior portion.....6
6. Dull yellowish green, scutellum and claval area smoky to dark brown.....7  
Claval area not smoky or brown, elytra usually with spots or crossveins pigmented.....8
7. Elytra smoky along commissural line; male styles, fig. 179C, shallowly excavated on inner margins; central portion of aedeagus, fig. 179A, more deeply and angularly excavated at apex.....8. *limonea*  
Elytra heavily and broadly marked with brown along commissure; male styles, fig. 180C, more deeply and roundedly excavated on inner margins; apex of central portion of aedeagus, fig. 180A, rather deeply and roundedly excavated.....6. *pectoralis*





Figs. 174-181.—*Ponana*, male genitalia. A, ventral aspect of aedeagus; B, lateral aspect of aedeagus; C, style, two views.

8. Male styles, fig. 178C, shallowly and roundedly notched on outer margins; central portion of aedeagus, fig. 178A, straight and bifurcate at apex; elytra with dark brown pigment markings, resembling crossveins, especially on clavus just posterior to scutellum. . . . . 4. *rubida*  
 Male styles, fig. 181C, deeply and angularly notched on outer margins; central portion of aedeagus, fig. 181A, constricted just before bifurcate apical portion; elytra pale to dark brown. . . . . 3. *aenea*

### 1. *Ponana scarlatina* (Fitch)

*Gypona scarlatina* Fitch (1851, p. 57).

*Gypona irrorella* Spangberg (1878b, p. 60).

*Gypona spadix* DeLong (1918b, p. 235).

*Gypona rodora* Ball (1920, p. 96).

Length 8.5–9.0 mm. Yellowish brown, completely dotted with bright red in well-marked specimens. Head narrow, vertex broadly rounded, almost twice as wide as long. Varying from buff to brown, and usually marked with red spots on all portions of dorsal surface. Veins frequently red. The degree and intensity of coloration is quite variable.

Female seventh sternite with well-produced rounded lateral angles, between which the posterior margin is concavely excavated either side of a broad median produced lobe, which is slightly notched at middle. Each male style, fig. 174, with apical portion narrowed but almost parallel margined to apex, which is rather broad and rounded and with a short point on inner apex. Aedeagus in ventral view, fig. 174, with a pair of forceps-like structures and a median elongated portion, which bears a pair of small curved lateral processes at the apex.

A widely distributed eastern species, *scarlatina* ranges west to Kansas and Texas.

**Illinois Records.**—OLIVE BRANCH: Horseshoe Lake, Aug. 2, 1934, DeLong & Mohr, 1 ♂. VIENNA: July 29, 1934, DeLong & Ross, 1 ♀.

### 2. *Ponana puncticollis* (Spangberg)

*Gypona puncticollis* Spangberg (1878b, p. 54).

*Gypona sanguinolenta* Spangberg (1878b, p. 63).

*Gypona grisea* Spangberg (1878b, p. 64).

*Gypona proscripta* Fowler (1903, p. 309).

Length 9 mm. Pale brownish, with four large round spots just behind anterior margin of pronotum and with elytra heavily marked with brownish irrorations. Vertex

rather strongly produced and rounded, more than half as long at middle as basal width between the eyes. Vertex and pronotum often with fine brown or reddish punctures. Elytra generally marked with small round brownish spots; in addition there are heavy brownish areas arranged in two broken transverse bands across each clavus. The intensity of these bands varies.

Female seventh sternite with produced rounded lateral angles, between which the posterior margin is concavely excavated either side of a broad median lobe, which is produced beyond the lateral angles and slightly notched at middle. Each male style, fig. 177, broad, narrowed toward apex, and constricted to form a thick finger-like curved tip, which is bluntly pointed at apex. Aedeagus appearing in ventral view with the paired lateral processes blunt at apices and rounded; median process long and slender, with broadened apex from which arise two lateral processes that are rigidly fastened together and form a semicircular band with sharp-pointed apices curved ventrally.

This species has been recorded from Florida.

### 3. *Ponana aenea* DeLong

*Ponana aenea* DeLong (1942, p. 94).

Length 8 mm. Resembling *scarlatina* in general appearance, but with more markedly produced vertex and with distinctive male genitalia. Vertex rather strongly produced, apex rounded, more than half as long at middle as basal width between eyes. Yellow, tinged with brown. Elytra pale to dark brownish (sometimes with reddish flecks as in *scarlatina*).

Female seventh sternite with lateral angles produced and rounded, between which the posterior margin is concavely excavated either side of a pair of short broadly rounded median lobes separated by a short median notch. Each male style, fig. 181, broad, rather deeply and concavely notched on ventral margin at about the middle, angularly notched on dorsal margin a little farther apically, then decidedly narrowed and produced, forming a thick finger-like process directed outwardly and pointed at apex. Aedeagus as viewed ventrally with the paired lateral processes tapered at apices; median slender portion bifid at apex, with very short apical processes.

The style and aedeagus are both excellent characters to separate this species from *scarlatina*.

This species has not been taken in Illinois, but is known to occur in Kansas and Missouri and east to Pennsylvania and Maryland.

#### 4. *Ponana rubida* DeLong

*Ponana rubida* DeLong (1942, p. 95).

Length 9.0–9.5 mm. Resembling *scarlatina* in general appearance, but with brown ramose markings on elytra and with distinctive male genitalia. Vertex broadly rounded, a little more than half as long at middle as basal width between eyes. Dark brown pigment markings of elytra resembling crossveins; these more abundant on claval areas just back of apex of scutellum. Female seventh sternite roundedly produced, shallowly and broadly notched at apex, slightly sinuate on either side about half way between lateral angles and apex. Each male style, fig. 178, even broader than in *aeuea*, not so deeply notched on either ventral or dorsal edges and with apex shorter, thicker, and more blunt at apex than in that species. Aedeagus with the median process narrow, constricted on dorsal side, then bifurcate and broadened; ventral portion forming a sheath that is not constricted.

This is chiefly a middle western species, but has been taken as far east as Pennsylvania.

**Illinois Records.**—Males and females, taken June 2 to August 23, are from Apple River Canyon State Park, Dolson, Fox Lake, Havana, La Grange, northern Illinois, Oakwood, Savanna, Urbana, and Vienna.

#### 5. *Ponana limbatipennis* (Spangberg)

*Gypona limbatipennis* Spangberg (1878b, p. 47).

Length 8.75–9.5 mm. Dark, with pale costal margins. Vertex broadly rounded, more than half as long as basal width between eyes. Color brownish yellow, vertex and pronotum usually unmarked, scutellum smoky, elytra usually smoky to black, apical half of each often paler with dark veins, costa with broad yellowish margin. Female seventh sternite with posterior margin slightly sinuate; broadly and shallowly notched at middle. Each male style, fig. 175,

rather slender, rather shallowly notched on ventral and dorsal margins, abruptly narrowed just before apex, the apical tip rather slender; finger-like apex curved to a point on inner margin. Aedeagus with the paired lateral portions narrowed just before apex, with apices blunt, divergent; median process slender, slightly enlarged at apex, median portion excavated, with a slight median tooth at base; each arm forming the excavation bifid at apex, the outer tooth shorter than the inner tooth. The characters of the aedeagus will easily separate this from all allied species.

This is a middle western species recorded from Ohio, Illinois, and Iowa.

**Illinois Records.**—ALCONQUIN: July 8, 1897, 1♀. APPLE RIVER CANYON STATE PARK: July 11, 1934, Ross & DeLong, 1♂, 1♀. MARSHALL: June 14, 1933, Frison & Ross, 1♂. OAKWOOD: June 14, 1935, Mohr, 1♂. STARVED ROCK STATE PARK: June 28, 1937, Ross & Burks, 1♂. STRATFORD: June 22, 1917, 1♂. URBANA: June 17, 1889, Hart, 1♂.

#### 6. *Ponana pectoralis* (Spangberg)

*Gypona pectoralis* Spangberg (1878b, p. 46).  
*Gypona albimarginata* Woodworth (1887, p. 31).

*Gypona bimaculata* Woodworth (1887, p. 32).  
*Gypona woodworthi* Van Duzee (1915b, p. 389).

Length 10 mm. Yellowish brown, with dark coloration on the corium and clavus of each elytron. Vertex broadly produced, more than half as long as basal width between the eyes. Disc of pronotum darker than elytra; scutellum darker on anterior half; elytra yellowish, subhyaline claval area more smoky and with brownish spots on each corium and clavus.

Female seventh sternite with posterior margin broadly and rather shallowly notched at middle, with a rounded lobe either side, the lobe usually slightly sinuate at middle. Each male style, fig. 180, broad, deeply and concavely notched on inner margin, then enlarged and sloped to a rather thick finger-like apex, which is formed by a deep angular notch on inner margin. Aedeagus with apices of lateral paired portions blunt and divergent, median portion slender, enlarged at apex, rather deeply notched, forming a pair of divergent pointed tips.

This species is distributed from the Dis-

trict of Columbia west to Kansas and Texas.

**Illinois Records.**—Many males and females, collected May 26 to August 22, are from Antioch, Dolson, Fox Lake, Galena, Grand Tower, Homan, Kampsville, Kankakee, La Grange, Mount Carmel, Oak Lawn, Oquawka, Pulaski, Savanna, Thebes, Vienna, Urbana, and White Heath.

### 7. *Ponana quadralaba* DeLong

*Ponana quadralaba* DeLong (1942, p. 98).

Length 7.0–8.5 mm. Small, yellowish to brownish, with four black spots on anterior portion of pronotum. Vertex broadly rounded, more than half as long at middle as basal width between eyes. Each elytron with a few brown blotches on clavus and apex of clavus, and one on corium.

Female seventh sternite concavely rounded from lateral angles to the slightly produced median third, which is broadly and shallowly notched at middle, forming a part of the proximal rounded lobes. Each male style, fig. 176, rather narrow, sides scarcely sinuate to a point near apex, where it is concavely excavated on inner margin, with apex strongly curved dorsally and produced into a finger-like process; style usually with a slightly enlarged blunt tooth on outer margin of curved portion at base of the finger-like process. Aedeagus with the paired lateral portions enlarged at middle, tapered to blunt apices; median process long, rather slender, decidedly broadened at apex, appearing deeply and angularly excavated, and forming two long divergent slender pointed processes; between processes is a membranous wall extending to one-fourth the distance from the pointed apices.

This species is distributed from New Jersey to Arizona.

**Illinois Records.**—Males and females, taken June 18 to October 2, are from Alton, Bluffs, Carbondale, Dubois, Elizabethtown, Gibsonia, Grafton, Omaha, Savanna, Shawneetown, Starved Rock State Park, Urbana, and Warren.

### 8. *Ponana limonae* Ball & Reeves

*Ponana scarlatina* var. *limonae* Ball & Reeves (1927, p. 498).

Length 10 mm. Smoky greenish, with a well-produced vertex. Vertex more than

half as long at middle as width between eyes. Vertex and pronotum often brighter green than elytra. Female seventh sternite almost truncate, with a broad shallow median notch at middle. Each male style, fig. 179, rather broad, with a produced rounded lobe on dorsal margin not far from apex; margin concavely rounded from rounded lobe to form a narrow produced apical process, which is pointed at tip. Aedeagus with lateral paired portions tapered to bluntly pointed apices; median process long, slender, enlarged at apex, with a pair of long slender tapered pointed processes separated by a deep V-shaped excavation.

This species is known from Ohio only.

## Subfamily LEDRINAE

The members of this subfamily are easily recognized by a combination of characters. The forewings are deeply pitted, and the anterior part of the body is dorsoventrally flattened so as to appear wedge shaped. The elytra are laterally appressed at their apices, and together appear wedge shaped.

Lawson (1931a) records 13 species in the only genus, *Xerophloea*, belonging to this subfamily in the United States.

## 29. *XEROPHLOEA* Germar

*Xerophloea* Germar (1839, p. 190).

*Mesodictis* Fieber (1866, p. 501).

*Parapholis* Uhler (1877, p. 461).

Fig. 21. Head broad, vertex broadly angled or broadly rounded in front, flat, anterior margin thin. Elytra long, angularly pointed, perpendicular at apices. The entire dorsal surface, especially the pronotum and elytra, coarsely and rather densely pitted. The broad head and pronotum and the perpendicular character of elytra at the apices give to the insect a characteristic wedge-shaped appearance.

Four species of the genus are known to occur in the eastern United States. Two of these have been collected in Illinois.

## KEY TO SPECIES

Vertex distinctly angulate, slightly over half as long at middle as width between eyes at base. Length 6.0–7.5 mm. .... 1. *viridis*  
Vertex broadly rounded, at least two-thirds as long at middle as basal width between eyes. Length 7.5–8.0 mm. .... 2. *major*

### 1. *Xerophloea viridis* (Fabricius)

*Cercopis viridis* Fabricius (1794, p. 50).  
*Xerophloea grisea* Germar (1839, p. 190).  
*Xerophloea virescens* Stål (1854, p. 253).  
*Parapholis peltata* Uhler (1877, p. 461).

Length 6.0–7.5 mm. Color green to brownish yellow. Head a little narrower than pronotum. Vertex convexly rounded on sides to a definitely angulate apex; little more than half as long at middle as basal width between eyes. Females usually light green, often marked with minute black dots, particularly along elytral veins. Males often appearing entirely brown, usually yellowish green, with the median line of vertex and posterior portion of pronotum brown.

A common species on upland meadows and prairies, *viridis* usually occurs on short grasses in association with *Aristida gracilis*. It is widely distributed throughout the United States.

Illinois Record.—OQUAWKA: on muskmelon, July 16, 1937, Mohr & Burks, 1 ♀.

### 2. *Xerophloea major* Baker

*Xerophloea major* Baker (1898e, p. 285).

Fig. 182. Length 7.5–8.0 mm. Large, stout, green, often well marked with numerous black dots. Head slightly narrower than pronotum. Vertex strongly and broadly rounded, two-thirds as long as width between eyes.

This species is unique in its large size and rounded vertex. It occurs in grasses

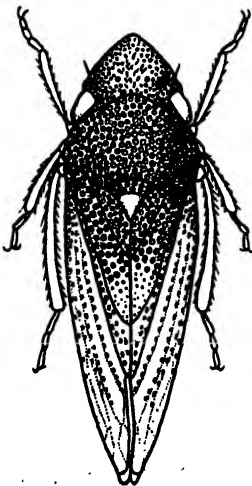


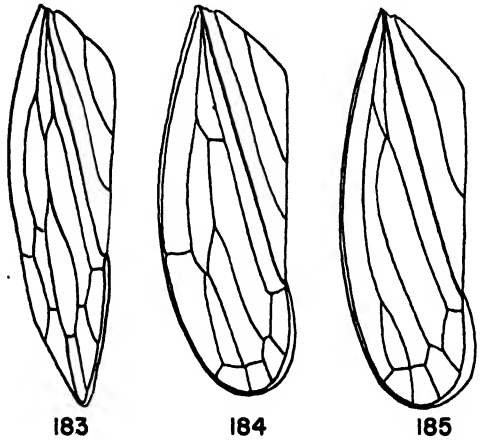
Fig. 182.—*Xerophloea major* ♀.

and is frequently found in the wet prairie. It ranges from the East Coast west to Tennessee and Kansas.

Illinois Records.—Males and females, taken June 27 to October 3, are from Albion, Alton, Anvil Rock, Barry, Cave in Rock, Kampsville, Oquawka, Port Byron, and Urbana.

### Subfamily DORYDIINAE

All the genera of this group, especially in the female, have a produced flattened vertex with a sharp thin foliaceous margin. The ocelli are on the front margin and usu-



Elytra of Dorydiinae

Fig. 183.—*Dorydiella kansana*.

Fig. 184.—*Parabolocratus flavidus*.

Fig. 185.—*Spangbergiella quadripunctata*.

ally very close to the eyes. The females of most of the genera have the elytra short, exposing the last one or more abdominal segments.

This subfamily is represented by seven genera in the eastern United States, and five of these occur in Illinois.

### KEY TO GENERA

1. Elytra narrowed posteriorly to pointed tips, fig. 183; general color brownish...  
 Elytra not narrowed posteriorly, apexes well rounded... 2
2. Vertex with a broad deep longitudinal furrow, extending nearly to base of head, and a slight ridge on either side; pronotum with a sharp median carina, fig. 187... 31. *Neoslossonia*
3. Vertex flat, or with a median carina... 3
3. Vertex extremely long and foliaceous, more than twice as long as basal width

between eyes, and with a median longitudinal carina extending nearly its full length, fig. 189; color brownish.....

.....30. *Dorycephalus*

Vertex usually more thickened, flat without carina, and not more than twice as long as basal width between eyes; color usually greenish, sometimes marked with black, red, or orange.....4

4. Elytra with one claval (anal) vein marked with red, fig. 185; head and pronotum with a pair of diagonal red or orange stripes.....33. *Spangbergiella*

Elytra with two claval veins, or veins obscured; stripes, if present, longitudinal.....5

5. Vertex decidedly longer than basa width between eyes.....6

Vertex not more than width between eyes, fig. 186B; color usually uniformly pale green.....34. *Parabolocratus*

6. Body above pale green, with a pair of reddish stripes extending from front margin of vertex to posterior margin of scutellum, fig. 190; at least veins in basal half of elytra marked with red, orange, or yellow.....32. *Hecalus*

Body above straw colored, marked with brown; vertex with a broad, brown, irregular longitudinal band, fig. 188....

.....36. *Dicyphonia*

### 30. *DORYCEPHALUS* Kuschakewitch

*Dorycephalus* Kuschakewitch (1866, p. 102).

Large, elongate, with extremely long produced flat head, which is thin and foliaceous on outer margin and at apex. Female with short elytra, exposing the last three to five dorsal segments of the abdomen; in the male the elytra usually extend to the apex of the abdomen.

The members of this genus are grass-feeding species and occur in prairie habitats. Eight species are known to occur in North America. Two of these have been collected in Illinois, and others may be found here.

#### KEY TO SPECIES

Head broad, front convex transversely; elytra more than half the length of abdomen in both sexes.....1. *platyrhynchus*

Head narrow, front strongly concave for its entire length; elytra less than half the length of abdomen in both sexes.....2. *vanduzel*

#### 1. *Dorycephalus platyrhynchus* Osborn

*Dorycephalus platyrhynchus* Osborn (1894, p. 216).

Fig. 189. Length of male 9-10 mm., female 14-15 mm. Female yellowish to brown-

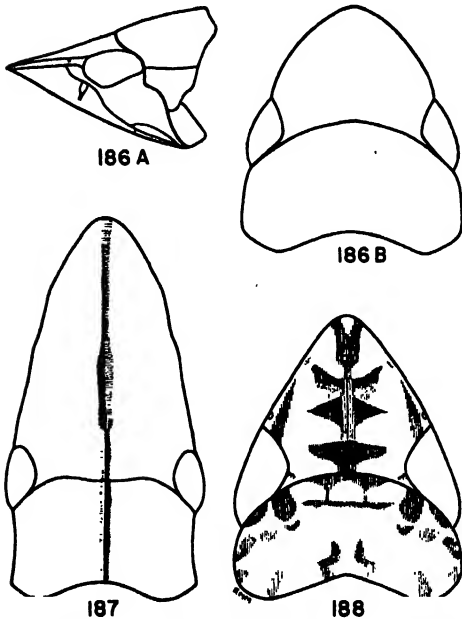


Fig. 186.—*Parabolocratus viridis*. A, lateral aspect; B, dorsal aspect of head and thorax.

Fig. 187.—*Neoslossonia putnami*, dorsal aspect of head and pronotum.

Fig. 188.—*Dicyphonia ornata*, dorsal aspect of head and pronotum.

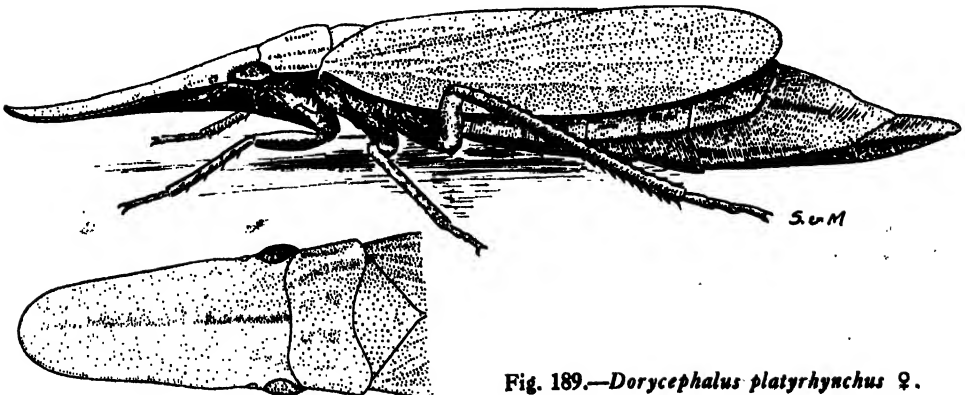


Fig. 189.—*Dorycephalus platyrhynchus* ♀.

ish, resembling a dried blade of grass; with a long foliaceous head having a median keel; vertex almost two and one-half times as long as basal width, broad to apex, which is broadly rounded. Elytra of female short, exposing the last three segments of the abdomen. Male usually brown, vertex about one and one-half times as long as basal width between eyes; elytra usually reaching tip of abdomen.

Female seventh sternite broadly and shallowly emarginate, almost truncate, with a short rounded median tooth. Male plates as long as combined basal width, concavely narrowed to blunt apices. Valve short and broad. Pygofer twice as long as plates.

This is a typical prairie species occurring on grasses of the prairie association. Recorded from two species of *Elymus* in Iowa, it is known from the Middle West ranging from Illinois to Colorado.

**Illinois Records.**—DECATUR: June 12-29, 1935, Frison, Mohr, & DeLong, 21 ♂, 8 ♀. HILLSDALE: June 5, 1940, Mohr & Burks, 1 ♂. ROCKFORD: July 5, 1932, Dozier & Mohr, 1 ♂. SUMMIT: July 17, 1935, DeLong & Ross, 1 ♀.

## 2. *Dorycephalus vanduzeei* Osborn & Ball

*Dorycephalus vanduzeei* Osborn & Ball (1898, p. 74).

Length 13-14 mm. Extremely long, slender, with thin flat head. Yellowish to green, marked with black spots. Entire insect is about 10 times as long as broad. Vertex three times as long as pronotum, foliaceous, apex broad, rounded, slightly elevated; front broadly, concavely, longitudinally depressed. Elytra short, reaching only to base of third abdominal segment, apices narrowed, rounded, and divergent. The abdominal segments each bear four small spots on the dorsal surface arrayed in two longitudinal rows. A lateral row each side is formed by a larger spot at the lateral line on each segment. Female seventh sternite long, almost truncate; male pygofer stylelike and very elongated.

This species occurs on the short grass, *Sporobolus cuspidatus*, and it has also been taken from the *Aristida purpurea* association. It has been previously recorded from Florida, Colorado, Kansas, and Nebraska.

**Illinois Record.**—OAK LAWN: July 11, 1945, DeLong & Ross, 1 ♂, 1 ♀.

## 31. *NEOSLOSSONIA* Van Duzee

*Neoslossonia* Van Duzee (1909a, p. 218).

Vertex obtusely triangular, almost flat, having a broad median longitudinal furrow, at either side of which is an elevated ridge. Pronotum with a median carina. Head as long as width at base; head and pronotum coarsely punctate.

Only one species of this genus, *putnami*, has been described, and it has been taken in Georgia and Florida. It has not been taken in Illinois, but in view of the peculiar occurrence of several typical Florida species in an area of the old Lake Michigan basin south and west of Chicago, it seems possible that it might at some time be found in that area of the state.

### 1. *Neoslossonia putnami* (Osborn)

*Dorycephalus putnami* Osborn (1907, p. 163).

Fig. 187. Length 5.5 mm. Broad, flat-headed, black, without color markings. Vertex almost flat, about as long at middle as basal width between eyes, with a broad median furrow. Vertex and pronotum coarsely punctate. Elytra reaching almost to tip of abdomen, minutely punctate. Male valve broad and short, triangular. Plates triangular, elongate, slender, acute at apices, about half as long as pygofer.

This species has been found on marsh grasses.

## 32. *HECALUS* Stål

*Hecalus* Stål (1864, p. 65).

*Glossocratus* Fieber (1866, p. 502).

Vertex longer than basal width, flattened, sharp and foliaceous at margin. Pronotum very short and broad. Clavus of each elytron with at least two veins. Elytra shorter than abdomen.

The members of this genus inhabit marshes, where they feed upon coarse grasses and sedges. Four species are known for the United States, and one of them is found in Illinois.

### 1. *Hecalus lineatus* (Uhler)

*Glossocratus lineatus* Uhler (1877, p. 463).

Fig. 190. Length of female 9 mm., male 7 mm. Long, broad, greenish, with a long thin flat vertex; four longitudinal bright

red stripes extending across vertex and pronotum, the central pair crossing scutellum. Elytra short in female, greatly exceeded by abdomen, nervures broadly reddish or yellowish; in the male, the elytra a little ex-

in front. Scutellum short. Elytra each with four apical cells.

One of the three Nearctic species of this genus occurs in Illinois on short grasses.

### 1. *Spangbergiella quadripunctata* Lawson

*Spangbergiella quadripunctata* Lawson (1932b, p. 120).

Length 6.0–6.5 mm. Sharp headed, green; vertex and pronotum green or greenish yellow, with two oblique divergent red stripes extending from near the apex of vertex to basal angles of scutellum. Vertex a little longer than basal width, roundedly angulate. Pronotum with a short median red stripe on posterior half. Each elytron with four parallel oblique red bands extending from costal area almost to inner margin.

Female seventh sternite truncate posteriorly. Male valve nearly concealed; each plate broad at base, abruptly narrowed, and produced into long point. The female is usually more yellow in color and less intensely marked with red.

This is a very common species on grasses in low moist meadows or in grassy woodlands. It is widely distributed over the Middle West, and occurs also in some of the eastern states.

**Illinois Records.**—CAVE IN ROCK: Oct. 2, 1934, Frison & Ross, 3 ♀; July 9, 1934, DeLong & Ross, 5 ♂, 8 ♀. DIXON SPRINGS: July 29, 1934, DeLong & Mohr, 1 ♂, 1 ♀; July 9, 1935, Ross & DeLong, 3 ♂, 3 ♀. FERN CLIFF: Aug. 3, 1934, DeLong & Mohr, 1 ♂. KARNAK: Aug. 8, 1934, Ross, DeLong, & Mohr, 1 ♂, 1 ♀. OLIVE BRANCH: Aug. 2, 1934, DeLong & Mohr, 1 ♀. VIENNA: June 14, 1934, DeLong & Ross, 1 ♀; July 29, 1934, DeLong & Ross, 2 ♂, 2 ♀.

### 34. *PARABOLOCRATUS* Fieber

*Parabolocratrus* Fieber (1866, pp. 502, 513).

Fig. 186. Head flattened, well produced, usually narrower than pronotum, with a definite margin, which is often thin and foliaceous; ocelli on margin near the eyes. Elytra macropterous in both sexes and often brachypterous in female.

Twenty species have been found in the United States; of these six are known to occur in Illinois. All of the species are found in marsh habitats on tall grasses.

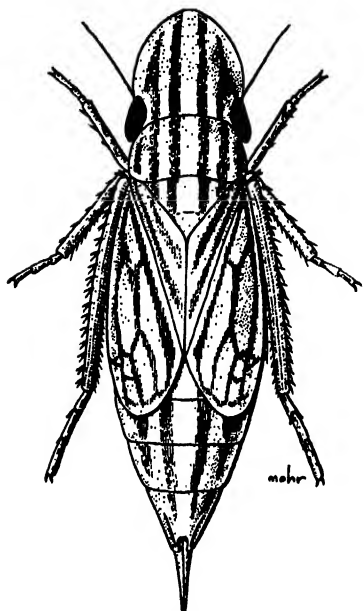


Fig. 190.—*Hecalus lineatus* ♀.

ceeded by the black abdomen and usually crossed by two broad black bands, one across middle and another covering apexes and a part of anteapical cells. Female seventh sternite long, slightly produced at center, appearing like a small lobe. Male plates long, triangular, acutely pointed.

This species ranges from New York west to Kansas, North Dakota, and Colorado. It is abundant in the marshes of the northern one-fourth of Illinois.

**Illinois Records.**—Males and females, taken May 4 to August 23, are from Alsip, Bement, Champaign, Fox Lake, Kankakee, La Grange, Normal, Oak Lawn, St. Anne, Summit, Tolono, Waukegan, and Zion.

### 33. *SPANGBERGIELLA* Signoret

*Spangbergiella* Signoret (1879, p. 273).

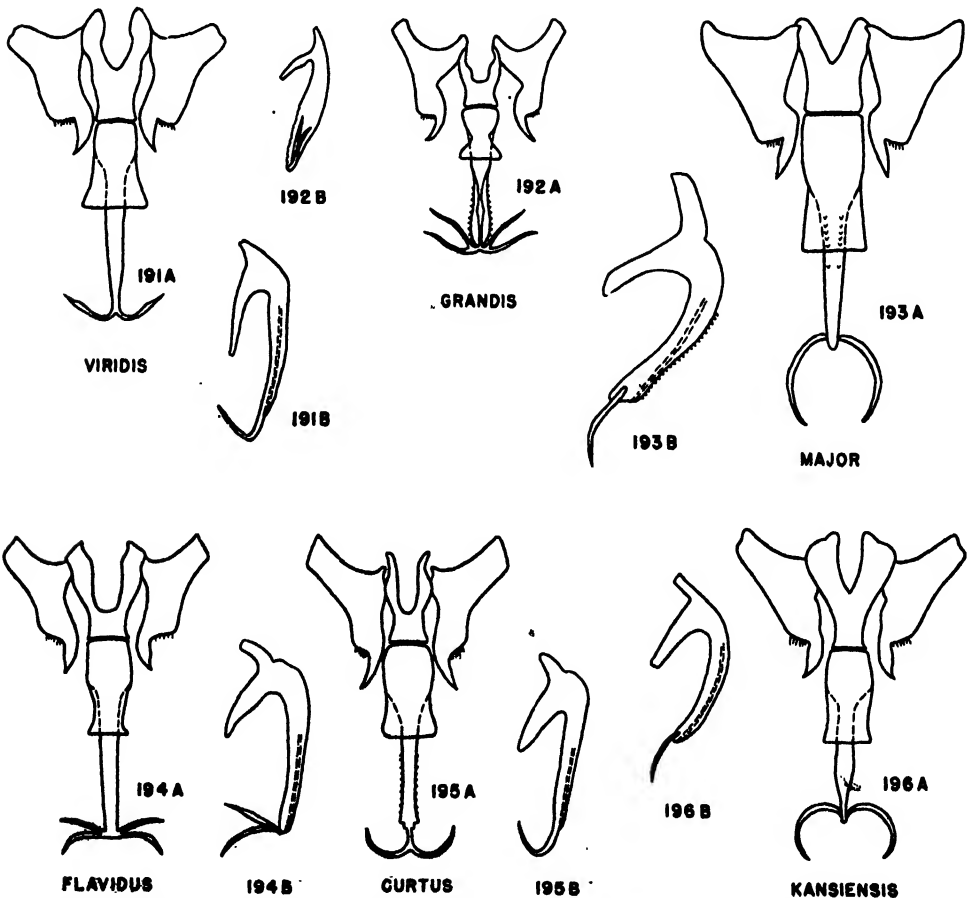
Fig. 185. Head strongly produced before the eyes, triangular, ocelli on sharp margin near the eyes. Front rather broad, convex, cheeks with oblique angles rounded. Pronotum twice as wide as long, slightly rounded



## KEY TO SPECIES

1. Females.....8
- Males.....2
2. Vertex margin thin, usually foliaceous at apex, usually marked with a brown line just beneath margin. Apical portion of aedeagus with a pair of unbranched lateral processes, as in fig. 191.....3
- Vertex margin thicker, not thin or foliaceous at apex, usually without a brown line beneath margin. Apical portion of aedeagus with a pair of branched processes.....7
3. Male pygofer each broadly rounded apically, not concavely rounded to the produced apical dorsal lobe nor notched on ventral margin near apex; apex of aedeagus as in fig. 193.....1. *rotundus*
- Male pygofer each concavely rounded on caudal margin to the produced apical dorsal lobe, or notched on ventral margin near apex, or both.....4
4. Lateral processes of aedeagus arising apically, as in fig. 191.....5
- Lateral processes of aedeagus arising

- laterally just before apex, as in fig. 193.....6
5. Vertex bluntly produced, about as long as pronotum and at least two-thirds as long as width between eyes.....2. *viridis*
- Vertex more broadly rounded, about two-thirds as long as pronotum, and about one-half as long as median width between eyes.....3. *curtus*
6. Margin of vertex broadly rounded, about two-thirds as long at middle as basal width. Each pygofer with a prominent notch on ventral margin near apex.....4. *major*
- Margin of vertex angulate at apex, slightly wider between eyes than median length. Each pygofer scarcely notched on ventral margin near apex.....5. *kansiensis*
7. Aedeagus, fig. 194, tapering on apical half to the bifurcate apical processes, which are about equal in length and widened at middle. Apexes of elytra usually brownish.....6. *flavidus*
- Aedeagus, fig. 192, roundedly enlarged before apex, then rapidly narrowed to



Figs. 191-196.—*Parabolocetrus*, male genitalia. A, ventral aspect; B, lateral aspect of aedeagus. (Redrawn after Shaw.)

the apical bifurcate processes; inner process of each pair considerably longer than the outer. Elytra usually entirely green.....7. *grandis*

8. Vertex as long as or longer than wide.....7. *grandis*  
Vertex wider than long.....9
9. A brown line below margin of vertex...10  
Without a brown line below margin of vertex.....11
10. Elytra exceeding ovipositor, vertex at middle distinctly shorter than pronotum.....3. *curtus*  
Elytra at least exceeded by tip of ovipositor; vertex about the same length as pronotum.....2. *viridis*
11. Vertex broadly rounded at apex; face appearing in profile rather strongly inflated.....4. *major*  
Vertex angularly produced; face scarcely inflated, almost straight.....12
12. Margin of vertex foliaceous; each elytron uniformly greenish but occasionally with small brown spot at tip of clavus.....5. *kanslensis*  
Margin of vertex thin but not foliaceous; each elytron with a small brown spot at tip of clavus and another at apex of fourth apical cell.....6. *flavidus*

### 1. *Parabolocratus rotundus* DeLong

*Parabolocratus rotundus* DeLong (1938d, p. 302).

Length of male 7 mm. Female not known. Color greenish without definite markings. Resembling *major* in form and appearance, but with broadly rounded pygofers. Vertex one-half wider than median length, a little longer than pronotum. Face strongly inflated. Elytra exposing only the pygofers. Male plates about one-half longer than combined basal width, not quite so long as pygofers, which are broadly rounded posteriorly and without a preapical notch on ventral margin. Aedeagus stout, in lateral view decidedly narrowed before apex; apex expanded and bearing a rather long stout lateral process on either side of expanded portion before apex, similar to fig. 193 for *major*. The rounded pygofers will immediately separate this species from any other species of the genus. In the other species, the pygofers are concavely rounded on caudal margins to produced apical lobes, or notched on ventral margins.

This species is known from Illinois and Ohio only.

**Illinois Records.**—DES PLAINES: Sept. 18, 1935, DeLong & Ross, 1 ♂. ZION: July 25, 1934, Frison & DeLong, 1 ♂; Aug. 7, 1935, DeLong & Ross, 3 ♂.

### 2. *Parabolocratus viridis* (Uhler)

*Glossocratus viridis* Uhler (1877, p. 462).

Length of male 5.0–6.3 mm.; female 6.5–8.5 mm. Large, yellowish green to bright green, with broadly rounded vertex. Vertex shorter than basal width; a brown line, frequently very short, below margin of vertex. Pronotum about the same length as vertex, sometimes slightly longer. Elytra of male extending beyond abdomen; of female exposing one or two abdominal segments (brachypterous) or only the ovipositor (macropterous). Costal margins of elytra usually whitish, apical portions brownish.

Female seventh sternite with posterior margin slightly and roundedly produced or truncate. Male valve broad and triangular. Plates about as long as combined basal width, slightly exceeded in length by pygofers, which are notched on ventral margins near apices. Aedeagus, fig. 191, tapered to apex, which bears a pair of apical terminal lateral processes.

This species is widely distributed throughout the northern states.

**Illinois Records.**—Many males and females, taken May 7 to September 21, are from Alsip, Amboy, Antioch, Aurora, Cedar Lake, Champaign, Chemung, Decatur, Downs, Eichorn, Elgin, Evergreen Park, Fox Lake, Fulton, Ingleside, Jonesboro, Kinmundy, Kirkwood, Lake Villa, Mayview, Oak Lawn, Ogden, Oquawka, Orangeville, Port Byron, Princeton, Putnam, St. Anne, Sheffield, Sparta, Spring Grove, Sun Lake, Urbana, Volo, Waukegan, and Zion.

### 3. *Parabolocratus curtus* Shaw

*Parabolocratus curtus* Shaw (1932, p. 41).

Length 5.5–6.5 mm. Yellowish green, a dark brown line below margin of vertex in both sexes. Vertex shorter than in *viridis*, much shorter than wide, in male about one-half as long as width between eyes. Pronotum in female a little longer than vertex, in male one-third longer than vertex; lateral margins white. Elytra exceeding abdomen in both sexes; costal margins whitish, apical margins brownish.

Female seventh sternite with posterior margin roundedly produced. Male valve broad and triangular. Plates a little longer than combined basal width. Pygofers a little longer than plates, with a distinct

notch on ventral borders just before apices. Aedeagus, fig. 195, with a pointed projection on either side before apex and a pair of terminal lateral curved processes.

This species, described from Kansas, probably occurs in the western portion of Illinois.

#### 4. *Parabolocratus major* Osborn

*Parabolocratus major* Osborn (1915, p. 110).

Length of male 6.0–6.8 mm., female 7.5–9.0 mm. Yellowish green to green, markings variable. Rather large, round headed, larger and with a broader head than that of *viridis*. Vertex shorter than broad, margin broadly rounded. Pronotum longer than vertex in male, shorter than vertex in female. Elytra of female exposing the last two abdominal segments; elytra of male exceeding length of abdomen.

Female seventh sternite with posterior margin slightly produced. Male valve broad and triangular. Plates a little longer than combined basal width. Pygofer a little longer than plates, ventral margins deeply notched close to apices. Aedeagus, fig. 193, stout, rather broad in lateral view, not narrowed apically; it bears a pair of long lateral processes before apex.

This species is found in the eastern United States and ranges west to Colorado.

It has been taken most commonly in Illinois in *Calamagrostis* meadows and similar marsh habitats.

**Illinois Records.**—Males and females, taken June 10 to September 6, are from Antioch, Des Plaines, Evergreen Park, Fox Lake, Grays Lake, Oak Lawn, St. Anne, Summit, Volo, Wauconda, and Zion.

#### 5. *Parabolocratus kansiensis* Shaw

*Parabolocratus kansiensis* Shaw (1932, p. 47).

Length of male 5.5–6.0 mm., female 8.0 mm. Rather large, pale green, a brown line below margin of vertex in both sexes. Head angulate, vertex wider between eyes than median length, margin decidedly foliaceous. Pronotum in male about equaling vertex in length, in female shorter than vertex. Elytra of female exposing one or two abdominal segments; elytra exceeding length of abdomen in male.

Female seventh sternite with posterior margin broadly rounded. Male valve broad,

triangular, plates about one-fourth longer than combined basal width. Pygofer exceeding length of plates, very faintly notched on ventral margins before apices. Aedeagus, fig. 196, in ventral view strongly narrowed apically and bearing a pair of unbranched processes before apex. Processes evenly curved inwardly.

This species is western in distribution and has been taken only from a marsh in the extreme western portion of the state.

**Illinois Record.**—LIMA: July 29, 1936, Mohr & Burks, 1 ♂, 2 ♀.

#### 6. *Parabolocratus flavidus* Signoret

*Parabolocratus flavidus* Signoret (1879, p. 276).

Length of male 4.5–6.0 mm., female 5.5–8.0 mm. Pale green to yellowish green, with angulate head. Vertex in both sexes shorter than wide, but more angulate in the male. Face pale orange below apex. Pronotum as long as vertex. Elytra of female exposing one or two abdominal segments or, in long-winged forms, reaching tip of ovipositor; in male the elytra exceed the abdomen; each elytron usually with a small brown spot at apex of clavus and another at end of fourth apical cell.

Female seventh sternite with posterior margin gradually produced. Male valve short and very narrow. Plates strongly and concavely narrowed apically, a little longer than basal width. Pygofer a little longer than plates, each tapered to pointed apex, not concavely rounded on ventral apical margin. Aedeagus, fig. 194, long in ventral view, with margins tapered to apex, which bears a pair of bifurcate processes on either side; two branches of each process about equal in length.

This species is found in the southeastern states and ranges into Arkansas and Kansas. It is common in the southern portion of Illinois, but has been taken only rarely in the northern half.

**Illinois Records.**—CARBONDALE: July 16, 1909, 1 ♀. CAVE IN ROCK: July 9, 1935, DeLong & Ross, 8 ♂, 3 ♀. DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♂, 1 ♀. DONGOLA: on juniper, May 11, 1917, 1 ♂. EVERGREEN PARK: July 1, 1935, DeLong & Ross, 1 ♀. THEBES: on cane, July 11, 1935, DeLong & Ross, 1 ♂. URBANA: Sept. 1, 1889, 1 ♂.

### 7. *Parabolocratius grandis* Shaw

*Parabolocratius grandis* Shaw (1932, p. 44).

Length of male 5.0–7.0 mm., female 7.5–9.0 mm. Yellowish green, elytra with a small dark brown spot at apex of each clavus. Vertex of female as long as or longer than wide, anterior margin rather broadly rounded; vertex of male wider between eyes than median length, more angulate apically. Pronotum of female much shorter than vertex; pronotum of male as long as vertex. Elytra of female very short, exposing the last four or five abdominal segments; elytra of male long, covering abdomen.

Female seventh sternite with posterior margin truncate or slightly produced medially. Male valve concealed, plates a little longer than basal width, exceeded by pygofers, which are tapered to acutely pointed apices, slightly concave on caudoventral margin. Aedeagus, fig. 192, short, in ventral view roundedly broadened before constricted apex, which bears a pair of bifurcate lateral processes, the inner branch of each longer than outer branch.

This species has been collected in the tall grasses in the marsh habitats of the Chicago area. It is recorded from Florida, Alabama, Texas, and Kansas.

**Illinois Records.**—EVERGREEN PARK: Aug. 23, 1934, DeLong & Ross, 2 ♀; July 1, 1935, DeLong & Ross, 7 ♂, 1 ♀. SUMMIT: July 17, 1936, DeLong & Ross, 1 ♂, 5 ♀; Aug. 21, 1936, DeLong & Ross, 2 ♀.

### 35. *DORYDIELLA* Baker

*Dorydiella* Baker (1897, p. 159).

Fig. 183. Vertex produced, roundedly angulate, foliaceous and upturned at apex; ocelli on margin next to the eyes. Head depressed, longer than pronotum. Elytra long, with apices acutely angled, each with four apical cells and two antepical cells; each clavus with two longitudinal veins.

Two species have been described or placed in this genus.

#### 1. *Dorydiella kansana* Beamer

*Dorydiella kansana* Beamer (1945, p. 48).

Length 8 mm. Large, yellowish, with brown markings, superficially resembling a *Paraphlepsius* such as *ramosus*. Vertex flat,

margin foliaceous and with brown spots. Face irrorate. Pronotum with brown longitudinal striae. Elytra long, apices acutely angled; ramose pigmented lines arranged longitudinally between the veins; a brown spot at apex of each elytron.

Female seventh sternite with three short rather broad V-shaped notches on the posterior margin and appearing serrate. Male plates triangular, pointed, almost as long as combined basal width. The nymphs have a long flat vertex similar to that of *Dorycephalus* adults, but during development to maturity this becomes shorter and forms a rather broad roundedly angled vertex.

The species has been found abundantly at the margins of lagoons along the shores of the Great Lakes, where it lives in the *Scleria-Eleocharis* association. It also occurs on small plants in the fresh-water marsh but less abundantly.

**Illinois Records.**—PRINCETON: swamp, July 7, 1934, DeLong & Ross, 4 nymphs. SHAWNEETOWN: June 27, 1936, DeLong & Mohr, 2 nymphs. WAUKEGAN: Aug. 5, 1935, Ross & DeLong, 1 ♂, 2 ♀. ZION: July 25, 1934, Frison & DeLong, 1 ♂.

### 36. *DICYPHONIA* Ball

*Dicyphonia* Ball (1900a, p. 69).

General form of *Parabolocratius*; vertex narrower, shorter, and more angular than in *Hecalus*. Disc of vertex concave, margins sharp, slightly foliaceous. Ocelli on margin close to eyes. Pronotum as wide as head across eyes and broadly rounded anteriorly.

Five species belonging to this genus are now listed for North America by Beamer (1936a); none of these has been collected in Illinois. In view of its known distribution, *ornata* may be found in the western portion of the state. All five species are apparently western in distribution.

#### 1. *Dicyphonia ornata* (Baker)

*Platymetopius ornatus* Baker (1900b, p. 49).  
*Dicyphonia ramentosa* Ball (1900a, p. 69).

Fig. 188. Length 5.25 mm. Yellowish, with produced vertex, rounded at apex and three-fourths as wide between eyes as median length. Vertex with a pair of dark spots behind apex, these usually fused; posterior to this are three abbreviated transverse bands, which are fused medially so as

to form a broad irregularly outlined longitudinal band. Pronotum with two short transverse bars anteriorly, and irregular dark markings on lateral portions. Elytra smoky on posterior portion, each with white spots. Male plates small, each broad at base, suddenly narrowed beyond middle into slender acute apex.

This species has been collected in Kansas, Colorado, and Utah.

### Subfamily APHRODINAE

Although the genera of this group vary considerably in size and shape, all have the ocelli distant from eyes, and, except in *Xestocephalus*, the ocelli are just above the margin of the vertex. Four genera are recorded in this subfamily for the United States, and three of these have been taken in Illinois.

#### KEY TO GENERA

1. Vertex rather flat, with acute margin forming definite limitations of vertex and front, fig. 32. .... 2  
Vertex sloping and rounding to front, with thick margin, or without definite margin, fig. 197. .... 3
2. Vertex transversely striate behind front margin between each eye and ocellus; length 5.0 to 6.0 mm. .... 37. *Stroggylocephalus*  
Vertex granulate behind front margin between each eye and ocellus; length 3.0 to 4.5 mm. Females of. .... 38. *Aphrodes*
3. Vertex nearly evenly rounded to front, with each ocellus about midway between eye and apex of vertex, fig. 197; pronotum extremely, finely, transversely wrinkled. .... 40. *Xestocephalus*  
Vertex more flattened and distinctly angled with front, as in fig. 32; pronotum conspicuously, transversely wrinkled. .... 4  
Each ocellus close to eye, about one-fourth distance between it and apex of vertex; width of vertex about one and one-half times its length, fig. 198. .... 39. *Memnonia*  
Each ocellus about one-half distance between eye and apex of vertex; width of vertex nearly twice its length. Males of. .... 38. *Aphrodes*

### 37. *STROGGYLOCEPHALUS* Flor

*Stroggylocephalus* Flor (1861, p. 210).

Vertex produced, obtusely angled, transversely striate in front. Margin foliaceous, ocelli close to front margin. Elytra coriaceous, each narrowly rounded at apex, coarsely punctate, appendix absent.

Only one northern species of this genus is known to occur in the United States.

#### 1. *Stroggylocephalus agrestis* (Fallen)

*Cicada agrestis* Fallen (1806, p. 23).

*Tettigonia mixta* Say (1825, p. 341).

Length 6-7 mm. Grayish yellow to dark brown, frons black, finely irrorate with pale brown. Vertex striate in front, smooth at base. Pronotum transversely striate. Elytra with the inner margins, bars and spots along nervures, and 12 or more spots on each costa brown or blackish. The female is usually paler than male and with fewer markings. Female seventh sternite concave, notched at middle.

This species occurs in moist grassy areas from New York to Colorado.

Illinois Records.—NORMAL: March 27, 1884, 2 ♀. CARY: grassy marsh, Nov. 26, 1946, Ross & Burks, 1 ♂, 1 ♀.

### 38. *APHRODES* Curtis

*Aphrodes* Curtis (1833, p. 195).

*Acucephalus* Germar (1833, p. 181).

*Pholetaera* Zetterstedt (1838, col. 288).

*Anoscopus* Kirschbaum (1858b, p. 357).

Fig. 32. Vertex obtusely angular, produced, in female usually tricarinate. Ocelli on front margin a little nearer the eyes than the apex.

Five species of this genus occur in the United States, all eastern in distribution. One species is known from Illinois.

#### 1. *Aphrodes albifrons* (Linnaeus)

*Cicada albifrons* Linnaeus (1758, p. 437).

*Cicada nitidula* Donovan (1799, p. 87, pl. 288, fig. 1).

*Aphrodes concinna* Curtis (1837, pl. 633).

*Aphrodes testudo* Curtis (1837, pl. 633).

*Pholetaera nigropunctata* Zetterstedt (1838, col. 288).

*Pholetaera livens* Zetterstedt (1838, col. 288).

*Acucephalus interruptus* Scott (1873, p. 264).

*Acucephalus polystolus* Scott (1873, p. 265).

*Acucephalus circumflexus* Provancher (1889, p. 282).

Length 3-4 mm. Rather small, variable in color, yellowish to brown, front pale. Female usually irrorate with black or brown; male with white spots on elytra, often in the form of large blotches or transverse bands. In the male, the elytra are usually shorter, exposing the tip of the abdomen.

Female seventh sternite with posterior

margin broadly and angularly emarginate to a central short U-shaped notch. Male plates more than twice as long as basal width, convexly narrowed on inner margins to bluntly pointed apices; inner margins contiguous, outer margins straight, causing plates to bend to a vertical position at apices.

This species ranges from New York to Wisconsin. It has an unusual habit for a member of the leafhopper group. Normally subterranean, it feeds for the most part upon grass roots. However, it has been swept from vegetation. Its distribution may be much wider than the records indicate.

**Illinois Records.**—Many males and females, taken June 9 to August 28, are from Algonquin, Apple River Canyon State Park, Chicago, Dolson, Kankakee, Mokena, St. Joseph, Starved Rock State Park, Sun Lake, Urbana, and Waukegan.

### 39. *MEMNONIA* Ball

*Memnonia* Ball (1900a, p. 66).

Fig. 198. In general form similar to *Aphrodes*, and with a convex sloping vertex, which has a rather thick margin. Ocelli on margin, distant from the eye. Face forming an acute angle with the vertex. Pronotum as long as vertex, strongly and transversely wrinkled. Macropterous and brachypterous forms.

Five species of this genus are listed for North America, but none of these has been taken in Illinois. Since two of them occur in the states just west of Illinois, and they are short grass species, it is possible they may be collected at some future time in Illinois.

#### 1. *Memnonia consobrina* Ball

*Memnonia consobrina* Ball (1900a, p. 66).

Length of male 3.0 mm., female 4.0–4.25 mm. Resembling *Aphrodes* in general form and appearance. Vertex roundedly produced, twice as wide between eyes as median length in female; vertex more pointed in male. Both macropterous and brachypterous forms are known. Female with vertex, pronotum, and scutellum green or yellowish green, elytra brownish or dark green, with nervures brown; face black to green, abdomen black. Male shiny black, eyes pale; elytra each with three or four white spots in a row across anteapical cells.

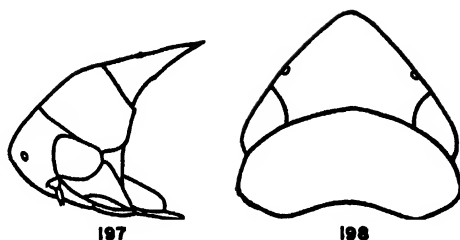


Fig. 197.—*Xestocephalus pulicarius*, lateral aspect of head and thorax.

Fig. 198.—*Memnonia consobrina*, dorsal aspect of head and thorax.

Female seventh sternite with posterior margin shallowly emarginate, bearing a median blunt tooth. Male valve scarcely visible. Plates only about half as wide at base as preceding segment, about three times as long as basal width, narrowed to acute tips.

This is a grass-feeding species that occurs on the prairie. It has been found abundantly in Colorado and Nebraska.

### 40. *XESTOCEPHALUS* Van Duzee

*Xestocephalus* Van Duzee (1894b, pp. 197, 214).

Fig. 197. General form ovate, head narrower than pronotum, subconical, vertex convex, sloping. Ocelli on anterior margin, distant from eyes. Antennae close to eyes. Elytra appearing rugose, without appendix, and with several apical areolate spots.

All of the species are small, usually not exceeding 4 mm. With few exceptions they are similar in color, and the genital structures of all the species are quite similar for either sex. As a result they are difficult to separate.

Peters (1933) and Knoll (1944) record 14 species in this genus for the United States, most of which are found in the East. Four species have been collected in Illinois, and at least two others may occur here.

#### KEY TO SPECIES

1. Vertex with distinct markings in the form of lines or spots.....2  
Vertex without distinct markings, with areas of uniform coloration.....3
2. Pronotum brown, with a broad white transverse band on posterior half, fig. 199.....1. *coronatus*  
Pronotum brown, marked with pale spots, without transverse band.....2. *pulicarius*
3. Length 4.0 mm.; black in color.....3. *piceus*

- Length not exceeding 3.75 mm.; brown or black.....4  
 4. Black in color.....4. *nigrifrons*  
 Brown in color.....5  
 5. Vertex pale brown; elytra brown, with a few hyaline markings near apexes. Length about 2 mm.....5. *brunneus*  
 Vertex pale brown, often with faint markings. Length 3 mm. or more.....  
 .....6. *superbus*

### 1. *Xestocephalus coronatus* Osborn & Ball

*Xestocephalus coronatus* Osborn & Ball (1897, p. 184).

Fig. 199. Length 2.5-3.0 mm. Vertex roundedly produced, about half as long as basal width between the eyes. Color white, with a large brown spot encircling each ocellus and extending two-thirds the length of vertex, leaving a median white longitudinal area, which is slightly divided by a brownish crossband back of apex. Face pale brown. Pronotum one-third longer than vertex, dark brown, with a broad white transverse band on posterior half. Scutellum brown, apical half paler. Elytra brown, each with paler areas, especially on the apical third; portions of veins on clavus and corium white.

This species is recorded from Iowa, Nebraska, and Wisconsin. Although only one specimen has been taken in Illinois, the species undoubtedly has a wider distribution in the state than this single collection indicates.

Illinois Record.—MARSHALL: Sept. 27, 1934, Frison & Ross, 1 ♀.

### 2. *Xestocephalus pulicarius* Van Duzee

*Xestocephalus pulicarius* Van Duzee (1894b, pp. 197, 215).

Length 2.5-3.0 mm. Small, brown, with distinct and conspicuous pale markings. Vertex rounded, with fulvous apex; a yellow line next to each eye extending toward apex, and a yellow line on posterior margin from which two lines extend forward and curve on disc; pronotum as long as vertex. Elytra marked with many white spots. Female seventh sternite emarginate, with a slightly produced lobe on either side. Male plates tapered beyond the middle to obtuse apexes.

Peters (1933) separated and described several new species of *Xestocephalus*. He

separated *similis* from *pulicarius* on the basis of a hooked process on the heel of the foot-shaped terminus of the style. In the present series of Illinois material, there are all gradations of this process from the process in the form he has designated as *pulicarius* to the strongly produced process he illustrated for *similis*. If *similis* is a distinct form, the character of the style cannot adequately be used for the separation of these species. It is the writer's opinion that *pulicarius* is a species with a great number of color variations that cannot be separated from one another by structural characters.

This is the most common species of the genus in Illinois and occurs on herbaceous



Fig. 199.—*Xestocephalus coronatus*. (From Osborn.)

vegetation, especially at the edge of woodland or in open wooded areas. It ranges from the eastern United States west to Utah.

Illinois Records.—Many males and females, taken March to November 13, are from Adair, Albion, Algonquin, Apple River Canyon State Park, Cave in Rock, Champaign, Clayton, Danville, Dolson, Dongola, Dubois, Fulton, Geff, Grand Detour, Havana, Herod, Hopedale, Horseshoe Lake, Kankakee, Karnak, La Grange, Marshall, Muncie, Oak Lawn, Oakwood, Olive Branch, Oquawka, Palos Park, Pere Marquette State Park, Pike, Pittsfield, Putnam, Rock Island, St. Anne, Sugar Grove, Temple Hill, Thebes, Urbana, Vienna, Volo, White Heath, White Pines Forest State Park, and Wilmington.

### 3. *Xestocephalus piceus* Osborn

*Xestocephalus piceus* Osborn (1928, p. 244).

Length 4 mm. Mostly black, with apex of vertex and upper part of face dark brown; elytra with paler spots on each

costa near apex. Vertex about twice as long at middle as length next to eyes. Genitalia not differing from those of other species in the genus. Pronotum a little longer than vertex.

This species occurs in southern Ohio and may be taken in Illinois in future collections.

#### 4. *Xestocephalus nigrifrons* Osborn

*Xestocephalus nigrifrons* Osborn (1915, p. 109).

Length 3 mm. Mostly black, as in *piceus*, but with a black face and smaller in size. This species may be only a very dark form of *pulicarius*, which is quite variable in color pattern. Although *nigrifrons* has not been collected in Illinois, specimens that are considered as *nigrifrons* have been found in Tennessee, and other specimens of this species might possibly be taken at some time in the southern portion of Illinois. It is also recorded from Maine.

#### 5. *Xestocephalus brunneus* Van Duzee

*Xestocephalus brunneus* Van Duzee (1907, p. 62).

Length 2 mm. Small, pale brown, without markings on the vertex. Vertex short, rounded, less produced than in *pulicarius*. Pronotum pale brown behind eyes. Each elytron dark at base, without spots, apical half paler, with spotted areas; quadrate spot on middle of costa, a smaller and darker one beyond this, and the apex broadly darker; two pale spots beyond the clavus along the sutural margin. Male genitalia similar in structure to those of other species of the genus.

Specimens that are identified as of this species have been taken in Illinois from herbaceous vegetation. The range of this species is in the eastern United States.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 1 ♀; June 29, 1935, DeLong & Ross, 4 ♀. EICHORN: May 11, 1935, Mohr, 4 ♂, 2 ♀. GRAFTON: along river, June 26, 1934, DeLong & Ross, 1 ♀. SPRINGFIELD: June 12, 1935, DeLong & Mohr, 2 ♂, 2 ♀. URBANA: June 20, 1915, 1 ♀; June 2, 1916, 1 ♂; June 17, 1916, 4 ♂; Sept. 12, 1934, Rice, 1 ♂. VIENNA: June 14, 1934, DeLong & Ross, 4 ♀.

#### 6. *Xestocephalus superbus* (Provancher)

*Dectocephalus superbus* Provancher (1890, p. 339).

*Xestocephalus fulvocapitatus* Van Duzee (1894b, pp. 197, 215).

Length 3.5 mm. Pale yellowish to brownish, with faint markings on the head, median longitudinal line paler than remainder of head. Pronotum light brown, with numerous white spots. Scutellum with darker basal angles. Elytra light brown, with darker spots on apical and costal areas, each with two pale spots on claval suture. Genital characters not different from those of other species of the genus.

This species, common in Illinois on herbaceous growth in open wooded areas, is distributed through the eastern states.

**Illinois Records.**—Males and females, taken May 8 to October 2, are from Aldridge, Algonquin, Danville, Dolson, Dongola, Dubois, Elizabethtown, Goreville, Hopedale, Marshall, Oak Lawn, Savanna, Urbana, and Wilmington.

#### Subfamily ATHYSANINAE

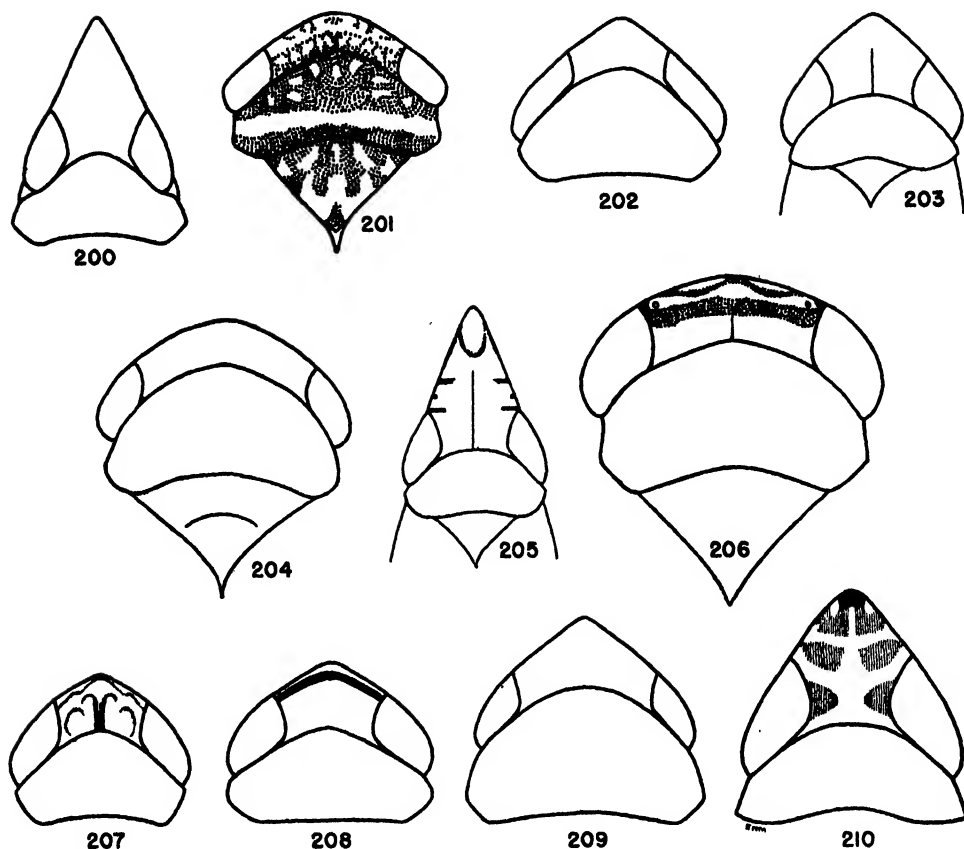
All the members of this group have the ocelli on or very near the front margin of the vertex and close to the eyes. The length and degree of thickness of the margin vary greatly among the genera.

This subfamily contains about 90 genera in the Nearctic region, and it is the largest group in the Cicadellidae. Sixty-two genera are treated in this report.

#### KEY TO GENERA

1. Gena visible behind or below eye from dorsal view, fig. 200.....2  
Gena not visible behind eye from dorsal view, as in fig. 201.....4
2. Elytra each with one cross nervure between first and second sectors; only two veinlets reaching costal margin, fig. 211.....47. *Japananus*  
Elytra each with two cross nervures between first and second sectors, as in fig. 214; numerous veinlets reaching costal margin.....3
3. Pale brown, with a broad pale yellowish longitudinal stripe extending from apex of vertex to apex of clavus; male aedeagus, fig. 241, without a pair of long slender processes....48. *Scaphytopius*  
Brown or black, without a longitudinal yellow stripe from vertex to clavus; male aedeagus, figs. 300-325, with a dorsal process and a pair of long slender processes.....49. *Cionanthus*

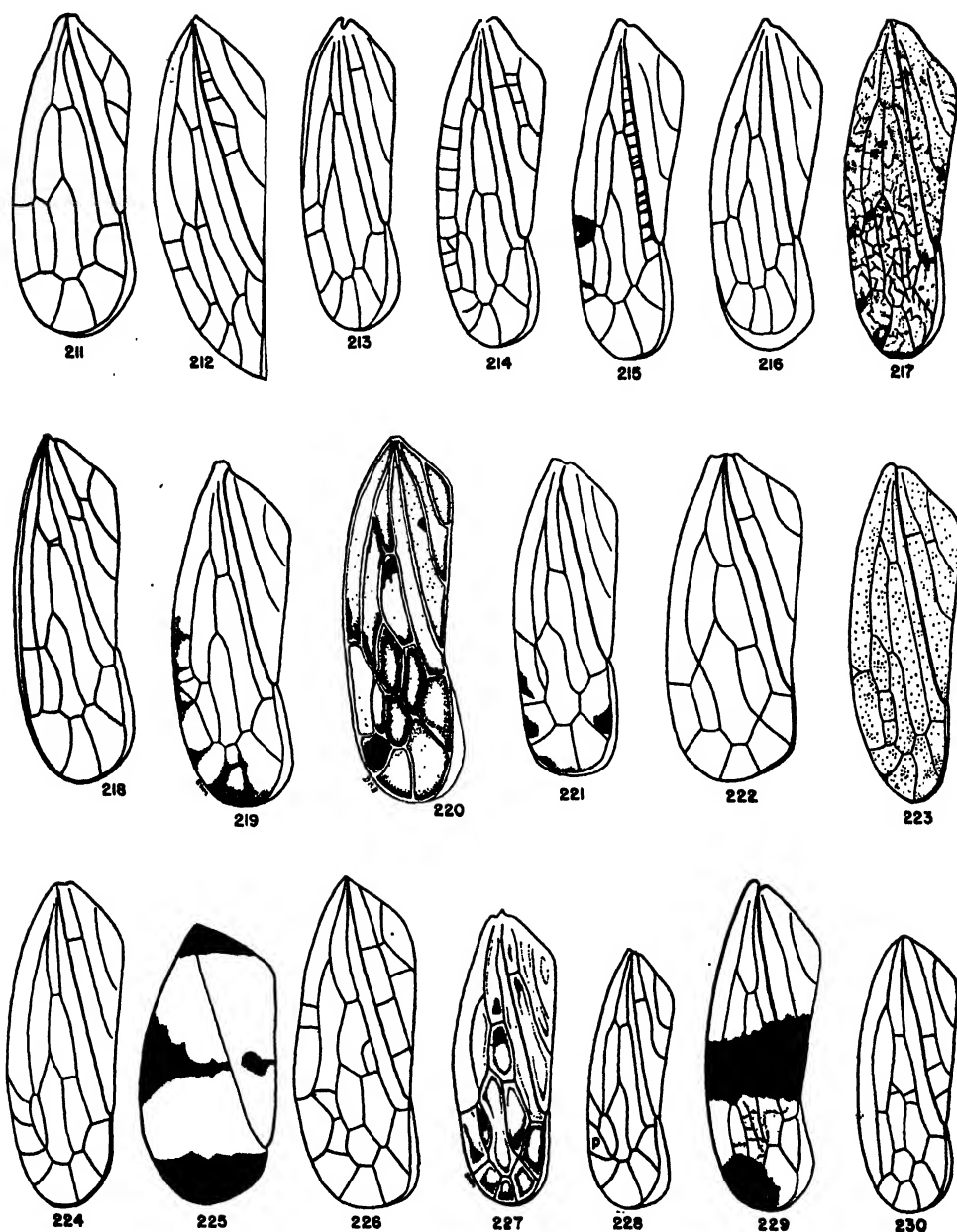




Athyasinae heads and pronota

Fig. 200.—*Cloanthanus cuprescens*.Fig. 201.—*Remadosus magnus*.Fig. 202.—*Tropicanus costomaculatus*.Fig. 203.—*Lonatura catalina*.Fig. 204.—*Chlorotettix unicolor*.Fig. 205.—*Acurhinus pyrops*.Fig. 206.—*Limotettix divaricatus*.Fig. 207.—*Atanus perspicillatus*.Fig. 208.—*Amplicephalus estacadus*.Fig. 209.—*Thamnotettix simplex*.Fig. 210.—*Gillettella atropuncta*.

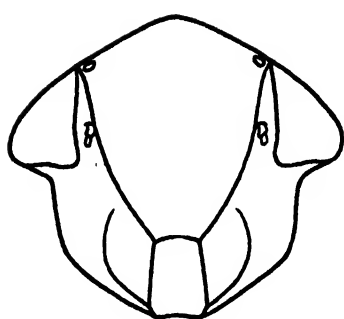
4. Clypeus broadest at apex and constricted at base or broadly constricted at middle, as in fig. 231A.....6  
Clypeus usually parallel sided, or narrowed at apex, not broadest at apex, as in fig. 232A.....5
5. Elytra very short, exposing at least five abdominal segments, as in fig. 403; veins of each elytron, if not obscured, reaching apex or only rarely with short cells at apex of elytron, as in figs. 237C, 238C.....18  
Elytra long, usually covering abdomen; at least one larger closed cell before apex of each elytron.....35
6. Costal margin of each elytron evenly rounded to the straight inner margin so that apex appears pointed, fig. 212....89. *Acinopterus*  
Apex of each elytron rounded, not pointed.....7
7. Elytra marked with ramose pigment lines or vermiculate lines or merging spots or dots, as in fig. 217.....8  
Elytra with various color markings but without ramose or vermiculate pigment markings.....14
8. Markings on elytra in the form of a saddle or broken band, fig. 229; vertex short, with an impressed transverse furrow just back of anterior margin.....82. *Norvellina*  
Elytra without saddle markings, or vertex without a transverse furrow.....9
9. Vertex parallel margined and about four times as wide as median length, fig. 201.....83. *Remadosus*  
Vertex longer at middle than next to eyes, fig. 202, and not more than three times as wide as long.....10
10. Head at least as wide as pronotum.....11  
Head narrower than pronotum.....12



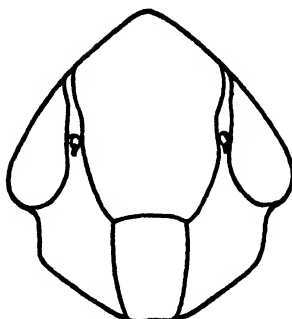
Athysaninae elytra. Abbreviation: "p" = postnodal cell.

- Fig. 211.—*Japananus hyalinus*.  
 Fig. 212.—*Acinopterus acuminatus*.  
 Fig. 213.—*Davisonia* major.  
 Fig. 214.—*Aligia modesta*.  
 Fig. 215.—*Prescottia lobata*.  
 Fig. 216.—*Exitianus obscurinervis*.  
 Fig. 217.—*Paraphlepsius tenessa*.  
 Fig. 218.—*Bandara johnsoni*.  
 Fig. 219.—*Menosoma cincta*.  
 Fig. 220.—*Arundanus proprius*.

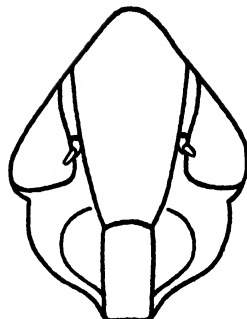
- Fig. 221.—*Palus delecor*.  
 Fig. 222.—*Latulus sayi*.  
 Fig. 223.—*Fieberiella florii*.  
 Fig. 224.—*Flexamia inflata*.  
 Fig. 225.—*Unoka ornata*.  
 Fig. 226.—*Polyamia weedi*.  
 Fig. 227.—*Hebecephalus cruciatus*.  
 Fig. 228.—*Scaphoideus immistus*.  
 Fig. 229.—*Norvellina seminuda*.  
 Fig. 230.—*Amplicephalus osborni*.



231A



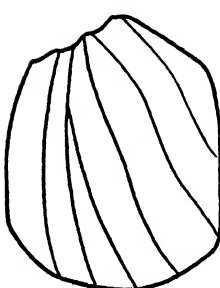
232A



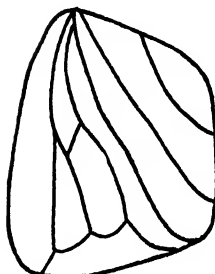
233A



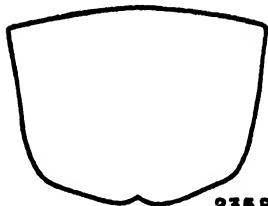
234B



237C



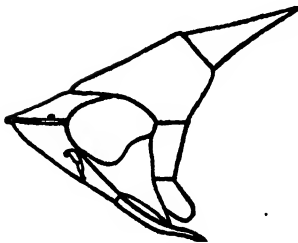
238C



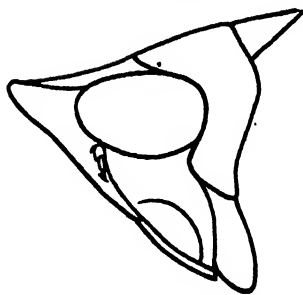
235B



236B



239D



240D

Athysaninae. A, face; B, seventh sternite of female; C, elytron; D, lateral aspect of head and thorax.

Fig. 231.—*Paraphlepsius optatus*.

Fig. 232.—*Flexamia inflata*.

Fig. 233.—*Gillettiella atropuncta*.

Fig. 234.—*Colladonus clitellarius*.

Fig. 235.—*Idiodonus kennicotti*.

Fig. 236.—*Psammotettix striatus*.

Fig. 237.—*Athysanella acuticauda*.

Fig. 238.—*Lonatura catalina*.

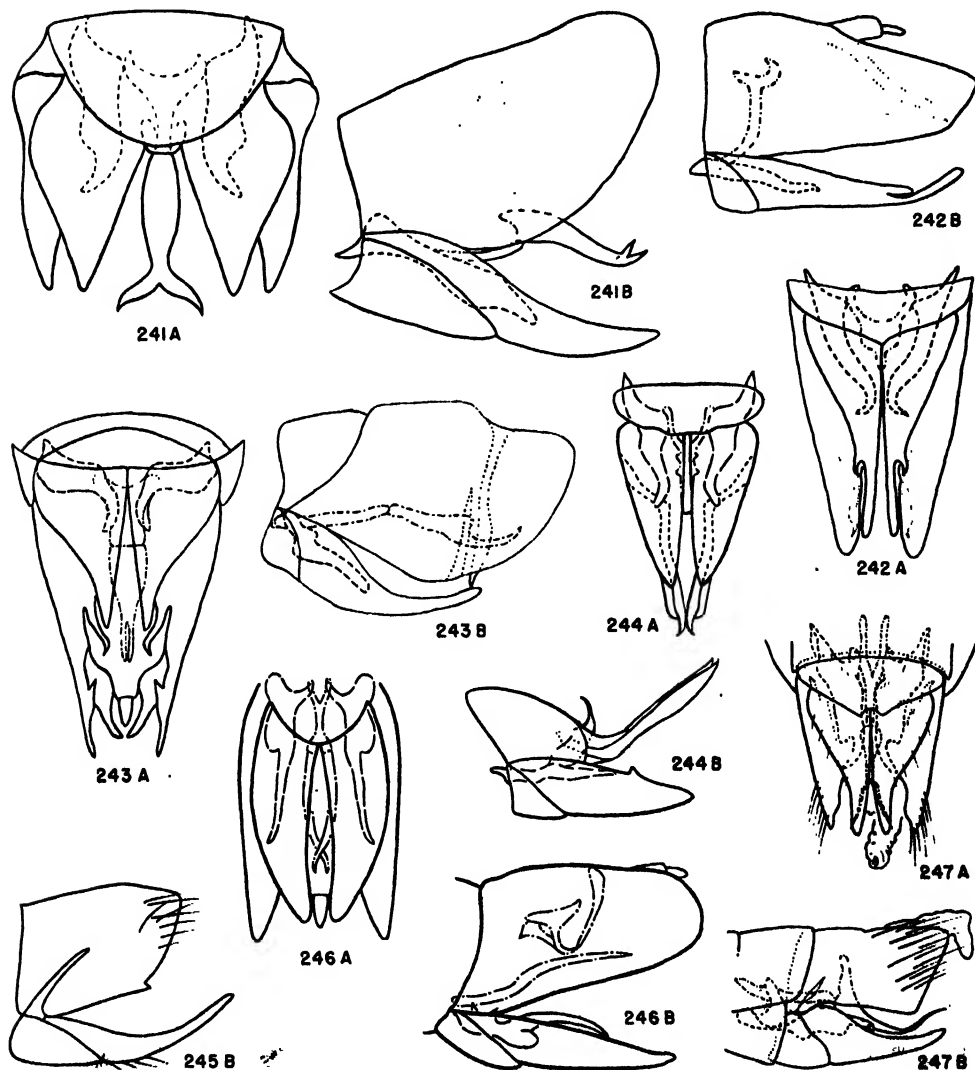
Fig. 239.—*Fieberiella florii*.

Fig. 240.—*Doratura stylata*.

11. Lateral margins of pronotum very short, eyes extending back almost to base of elytra, fig. 202. .... 84. *Tropicamus*
- Lateral margins of pronotum longer, eyes distinctly separated from base of elytra, figs. 422, 423. .... 85. *Paraphlepsius*
12. Vertex with two large black spots on margin. Male plates, fig. 242, deeply notched on outer margins. .... 79. *Orientus*
- Vertex without marginal spots; male plates not notched on outer margins. .... 13

13. Head about three-fourths as wide as pronotum. Anterolateral margin of pronotum strongly sloping to eyes. Elytra decidedly elongate. Male pygofer each with a pronounced rounded apical lobe. Female seventh sternite truncate, with a median narrow incision, figs. 429-432. .... 87. *Iowanus*
- Head only slightly narrower than pronotum; anterolateral margin of pronotum less sloping to eyes, as in fig. 422. Elytra rather short and broad. Male pygofer without apical rounded lobes,

- fig. 428. Female seventh sternite excavated or broadly notched, fig. 428. . . . . 86. *Texananus*
14. Claval veins of each elytron obliquely angled with commissural margin, as in fig. 423. . . . . 22
- Claval veins of each elytron bent so as to meet commissural margin at right angle, fig. 215. . . . . 15
15. Elytron with supernumerary veinlets along claval suture, fig. 215. . . . . 44. *Prescottia*
- Elytron without supernumerary veinlets along claval suture, fig. 228. . . . . 16
16. Male plates long and attenuated; figs. 280-286; one or two veinlets arising from outer anteapical cell and reaching costal margin. . . . . 43. *Osbornellus*
- Male plates variable, not attenuated; two to four veinlets arising from outer anteapical cell, fig. 228. . . . . 17
17. Male plates, fig. 246, gradually tapered to bluntly pointed apices, almost as long as pygofer, and reaching to tip of anal tube. . . . . 42. *Lonenus*



Athyasinae male genitalia. A, ventral aspect; B, lateral aspect.

Fig. 241.—*Scaphytopius elegans*.

Fig. 242.—*Orientus ishidae*.

Fig. 243.—*Fieberiella florii*.

Fig. 244.—*Paluda mella*.

Fig. 245.—*Macrosteles divinus*. (Redrawn after Dorst.)

Fig. 246.—*Lonenus intricatus*.

Fig. 247.—*Doleranus vividus*.

- Male plates, figs. 248-279, much shorter, not reaching anal tube. . . . . 41. *Scaphoideus*
18. Vertex very narrow and conical, one and one-third times as long as width between eyes, fig. 210; antennal fossa touching eye, fig. 233*A*. . . . . 66. *Gillettella*  
Vertex equal to or less than width between eyes, as in fig. 209. . . . . 19
19. Anterior margin of vertex sharply angled with front, the apex slightly turned up, fig. 240*D*. . . . . 69. *Doratura*  
Anterior margin of vertex bluntly angled or rounded to front. . . . . 20
20. Wing veins usually indistinct. . . . . 21  
Five distinct veins, an outer one forked near middle, fig. 237*C*. . . . . 71. *Athysanella*
21. Color uniformly straw yellow; antennal fossa touching eye or extremely close, as in fig. 233*A*; vertex conical, fig. 203. . . . . 56. *Lonatura*  
Body black or bicolored; antennal fossa separated from eye by at least half its width; vertex evenly rounded, fig. 403. . . . . 70. *Driotura*
22. Dark straw colored above, the entire dorsum covered with many very small brown dots; outer antepical cell, fig. 223, divided, with one to three crossveins reaching costal margin from anterior cell; front margin of vertex thin and sharply angulate, fig. 239*D*. . . . . 88. *Fieberiella*  
Color variable but without small brown dots; outer antepical cell usually entire, as in fig. 218. . . . . 23
23. Four or more crossveins reaching costal margin from outer antepical cell and outer branch of the first sector, figs. 214, 295. . . . . 24  
Two crossveins reaching costal margin from outer antepical cell and none from outer branch of first sector, as in fig. 218. . . . . 27
24. Margin of vertex acutely angled with front. . . . . 25  
Margin of vertex obtusely angled with front. . . . . 26
25. Vertex narrowly and transversely depressed behind anterior margin; numerous crossveins on discs of elytra next to each claval vein, fig. 295. . . . . 80. *Mesamia*  
Disc of vertex flat, slightly depressed but not narrowed behind margin, fig. 298; elytra without crossveins next to each claval vein. . . . . 46. *Platymetopius*
26. Costal veins conspicuously expanded on margin, fig. 219. . . . . 78. *Menosoma*  
Costal veins even in width, scarcely at all expanded on margin, fig. 214. . . . . 81. *Aligia*
27. Vertex nearly acutely angled with front and with a slight transverse depression behind apex. . . . . 28  
Vertex more bluntly angled with front and without depression behind apex. . . . . 29
28. Vertex finely and longitudinally striate; pronotum finely and transversely striate. . . . . 91. *Eutettix*  
Vertex and pronotum smooth and without striae. . . . . 90. *Bandara*
29. Side of pronotum behind eye extremely narrow, fig. 207. . . . . 94. *Atanus*  
Side of pronotum behind eye at least as wide as posterior tibia at base, fig. 204. . . . . 30  
Width of vertex more than twice its median length, fig. 204, and generally more rounded to front. . . . . 31  
Width of vertex not more than twice its median length, fig. 463, and generally more flattened and angulate with front. . . . . 33
31. Color generally uniformly green or straw yellow, and not sharply contrasting on dorsum or with dark spots on vertex. . . . . 92. *Chlorotettix*  
Colors usually sharply contrasting, or nearly uniformly dark brown, with dark spots on vertex. . . . . 32
32. Female seventh sternite, fig. 234*B*, excavated, with a long spatulate process at middle of excavation; elytra dark brown, with a yellow saddle spot on each clavus, fig. 465 (Illinois species). . . . . 99. *Colladonus*  
Female seventh sternite, fig. 235*B*, produced on posterior margin and with a slight median incision; elytra variously colored. . . . . 98. *Idiodonus*
33. Anterior margin of vertex with black spots or bands, figs. 462, 463. . . . . 96. *Cicadula*  
Margin of vertex without black spots or bands. . . . . 34
34. Male plates, fig. 244, each with dorsal blunt spine on apical half; each pygofer terminating in a bladeliike process as long as basal portion. . . . . 97. *Paluda*  
Male plates each without dorsal spine, as in fig. 247; each pygofer rounded or angled. . . . . 35
35. Seventh sternite of female deeply and sinuately emarginate; outer margin of male plate, fig. 247, sinuate before apex. . . . . 93. *Doleranus*  
Seventh sternite of female slightly emarginate or a little produced; outer margin of male plate, fig. 461, evenly curved to apex. . . . . 95. *Elymana*
36. At least pronotum and elytra entirely black; outline of veins indistinct on discs of elytra. . . . . 37  
Pronotum and elytra not entirely black; outline of veins usually distinct. . . . . 38
37. Vertex bluntly angled; head wider than pronotum, fig. 409. . . . . 74. *Ophiola*  
Vertex almost evenly rounded; head and pronotum subequal in width, fig. 403. . . . . 70. *Driotura*
38. Color pale green, with a large isolated dark spot in middle of each elytron. . . . . 51. *Flexamia*  
Color variable and without isolated black spot. . . . . 39
39. Elytra with a large irregular brown X-shaped mark, the lower arms joined on suture by an irregular band. . . . . 45. *Sanctanus*

- Elytra without X-shaped mark. . . . . 40
40. Elytra milky white, with three complete brown to black cross bands, one at base, a median band, and a subapical one, fig. 225. . . . . 64. *Unoka*  
Elytra with not more than two cross bands. . . . . 41
41. Pronotum with four or six longitudinal dark stripes, the median pair continued on the pronotum, as in fig. 401. . . . . 42  
Pronotum without stripes continued on pronotum. . . . . 43
42. Vertex longer than wide and with two longitudinal stripes anterior to median pronotal pair, fig. 327. . . . . 51. *Flexamia*  
Vertex wider than long, with two rounded spots anterior to median pair of pronotal stripes, figs. 392, 394. . . . . 68. *Commellus*
43. Dorsum with a single broken longitudinal dark band extending from apex of vertex to apex of clavus; entire end of each elytron with wide appendix. . . . . 51. *Flexamia*  
Dorsum without a single median band; each elytron with appendix variable. . . . . 44
44. Inner sector of each elytron not forked and with only two anteapical cells, fig. 213. . . . . 68  
Inner sector of each elytron twice forked, forming three anteapical cells, as in fig. 227. . . . . 45
45. Elytra each with two or more crossveins between first and second sectors, as in fig. 224. . . . . 46  
Elytra each with not more than one crossvein between first and second sectors, as in fig. 216. . . . . 59
46. Vertex fully twice as long as wide and depressed on each side of apex below margin, fig. 205. . . . . 50. *Acurhinus*  
Vertex much less than twice as long as wide and convex on each side of apex below margin. . . . . 47
47. Usually four to eight crossveins on each clavus, as in fig. 226. . . . . 48  
Usually not more than one to three crossveins on each clavus. . . . . 49
48. Length usually exceeding 4 mm.; vertex about one and one-half times as wide as long, fig. 208. . . . . 60. *Amplicephalus*  
Length usually less than 3 mm.; median length of vertex and width subequal. . . . . 54. *Polyamia*
49. Central anteapical cell divided, fig. 220; apical cells sometimes very short. . . . . 50  
Central anteapical cell not divided, fig. 224; apical cells usually longer. . . . . 52
50. Inner apical cell of each elytron with a dark spot inside the posterior angle, fig. 221. . . . . 53. *Palus*  
Inner apical cell of each elytron without a spot inside posterior angle, although veins may be marked with fuscous, fig. 220. . . . . 51
51. Length usually 4 mm. or more; disc of vertex flat or even slightly depressed. . . . . 61. *Arundanus*  
Length usually less than 3 mm.; disc of vertex convex. . . . . 55. *Deltoccephalus*
52. Costal region of each elytron with strongly reflexed veins arising from outer anteapical cell and reaching costal margin, fig. 224; head with a small depression behind apex. . . . . 51. *Flexamia*  
Costal veins usually at most only slightly angulate forward from outer anteapical cell, fig. 221; head without depression behind apex, although it may be somewhat flattened between eyes. . . . . 53
53. Color above uniformly straw yellow, orange, or brown, and without markings, fig. 203. . . . . 56. *Lonatura*  
Color variable but always with additional markings on head, pronotum, or elytra. . . . . 54
54. Inner apical cell of each elytron with a distinct dark spot inside posterior angle, fig. 221; vertex usually with a pair of longitudinal broken stripes, figs. 345-347; usually a dark spot on margin of elytron in front of costal veinlets. . . . . 53. *Palus*  
Without dark spot inside posterior angle of inner apical cell, although cell often margined with fuscous; head may be marked but without longitudinal stripes. . . . . 55
55. Appendix of each elytron very narrow and extending only slightly beyond posterior angle of inner apical cell, fig. 222; elytra usually broader at or near apex of each clavus. . . . . 52. *Latulus*  
Appendix of each elytron broader and extending at least to middle of apical cell, as in fig. 227; elytra usually more slender and not broader near apex of each clavus. . . . . 56
56. Veins of elytra, especially in apical region and on each clavus, heavily and nearly uniformly margined with black or brown, fig. 227. . . . . 57. *Hebecephalus*  
Veins of elytra unmargined with black or brown, or only irregularly so. . . . . 57
57. Vertex bluntly angled and slightly convex, fig. 368. . . . . 55. *Deltoccephalus*  
Vertex generally more acutely angled, and flat or even a little depressed. . . . . 58
58. Male plates, figs. 378-385, decidedly larger than valve; female seventh sternite, fig. 386, notched, produced, or with teeth, not simple on posterior margin. . . . . 58. *Laeviccephalus*  
Male plates, figs. 387, 388, short, smaller than valve; female seventh sternite, fig. 236B, usually broadly and concavely rounded. . . . . 59. *Psammotettix*
59. Appendix of each elytron extending broadly around entire apex, fig. 216. . . . . 72. *Exitianus*  
Appendix, if present, not extending beyond middle of apex of elytron, as in fig. 230. . . . . 60
60. Vertex short and broad, very little longer at middle than next to eyes, and less than one-half its width between eyes, fig. 206. . . . . 61  
Vertex angulate, conspicuously longer at middle than next to eyes, and equal to or more than one-half its width between eyes, fig. 399. . . . . 62
61. Color bright green; elytra with white areolar spots; vertex unmarked. . . . . 75. *Opahus*

- Color more yellowish or dull green to brown; vertex with a transverse brown band, fig. 206. .... **76. Limotettix**
62. Vertex longer than or equal in length to width between eyes, as in fig. 395. .... **63**  
Vertex distinctly shorter than width between eyes, as in fig. 397. .... **64**
63. At least some of apical wing veins brown; head equal in width to or slightly narrower than pronotum, figs. 395, 396. .... **67. Stirellus**  
Veins uniformly yellow or greenish; head distinctly wider than pronotum. .... **65. Unerus**
64. Pronotum with a very distinct shiny black transverse band on basal half behind head, fig. 397. .... **63. Amblysellus**  
Pronotum without distinct band, although often with faint to distinct transverse lines. .... **65**
65. Color above uniformly pale green; vertex with four black spots, in addition to dark ocelli, close to front margin, fig. 391. .... **62. Graminella**  
Color usually some shade of brown or straw yellow and sometimes with faint to distinct transverse bands or lines on vertex. .... **66**
66. Vertex uniformly yellowish and with a narrow dark band behind front margin reaching from eye to eye, fig. 208. .... **60. Amplicephalus**  
Vertex marked or unmarked but without narrow band behind front margin. .... **67**
67. Vertex and pronotum with irregular or sinuate transverse black to dark brown lines, fig. 409. .... **74. Ophiola**  
Vertex and pronotum sometimes obscurely marked with darker spots but without transverse lines. .... **68**
68. Vertex distinctly angled and twice as long at middle as length next to eyes, fig. 209; body slender, more than three times as long as wide; elytra covering abdomen. .... **77. Thamnotettix**  
Vertex more bluntly angled and at middle, not more than one and three-fourths times length next to eyes, fig. 405; body usually broad, less than three times as long as wide; elytra often short, exposing apex of abdomen. .... **73. Euscells**
69. Vertex sharply angulate and much longer than width between eyes; each eye longer than distance between eyes, fig. 210; appendix of each elytron extending completely around apex. .... **66. Gillettella**  
Vertex usually more bluntly angulate to evenly rounded and never more than width between eyes, as in figs. 466, 472; appendix of each elytron not reaching beyond apical cell. .... **70**
70. Vertex longer at middle than next to eyes, figs. 472-477. .... **71**  
Vertex almost parallel margined, figs. 466-468. .... **100. Davisonia**
71. Ovipositor greatly extending beyond pygofera; each male pygofer without notch or process on posterior margin. .... **71. Athysanella**  
Ovipositor extending only to apex of each pygofer; male pygofer with notch or process on posterior margin, as in fig. 245B. .... **72**
72. Each male pygofer faintly notched on posterior margin. .... **101. Sonronius**  
Each male pygofer with a small finger-like process on posterior margin, fig. 245B. .... **102. Macrosteles**

#### 41. SCAPHOIDEUS Uhler

*Scaphoideus* Uhler (1889, p. 33).

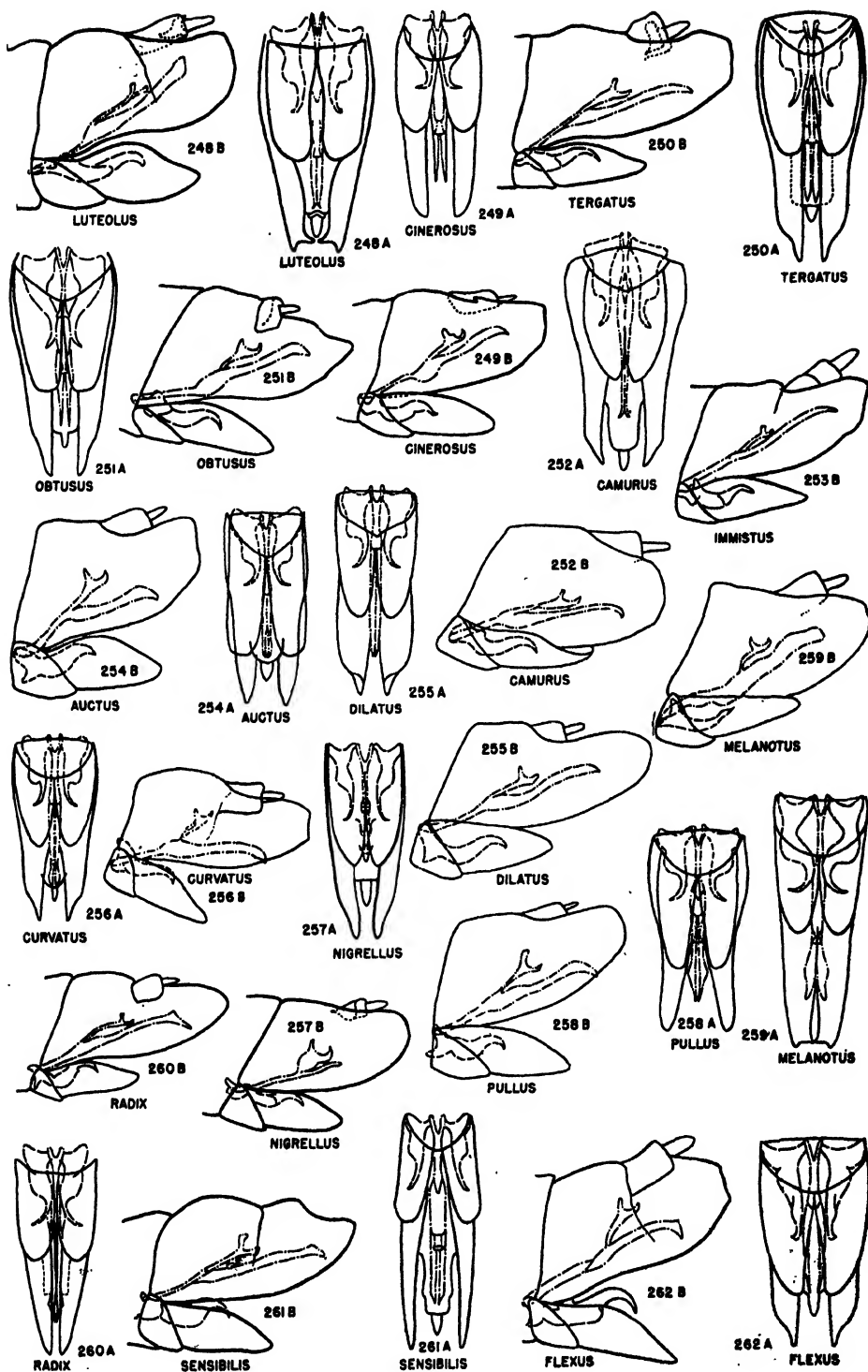
Fig. 228. Vertex produced, triangular, flat above, bluntly angled. Outer antepical cell of each elytron oblique, the basal portion of which bears two or three oblique veinlets to costa. Practically all the species of the genus have rather conspicuous color markings. The commissural line is usually marked with a white stripe, which is variously broken by dark coloration and in most species forms a specific recognition color pattern.

Insofar as records go, the species of the genus seem to occur frequently upon rank growing herbaceous vegetation, such as *Solidago* and *Aster*, especially in open woodland and similar habitats.

DeLong (1939a) reviewed the species of *Scaphoideus* and recorded 46 species as occurring in the United States. Nearly all of these are found in the eastern United States, and 31 species are known from Illinois.

#### KEY TO SPECIES

1. Males. .... 2  
Females. .... 33
2. Usually small, narrow, length not exceeding 6 mm. Plates only slightly narrowed apically, apexes broadly rounded, as in fig. 248. .... 3  
Usually larger, robust, length over 6 mm. Plates broad at bases, gradually narrowed to inner margins, apexes bluntly or sharply angled, as in fig. 271. .... 21
3. Dorsal process of aedeagus in lateral view with a long slender basal portion, bifurcate at apex, as in fig. 250; ventral portion usually much longer than dorsal. .... 4  
Dorsal process of aedeagus shorter, more inflated or bulbous, usually with a pair of small terminal processes, as in fig. 257; ventral portion shorter than or only slightly exceeding dorsal process. .... 17
4. Claval areas of elytra brown, almost unicolorous, without spots or pale areas, veins inconspicuous. .... 5  
Claval areas of elytra spotted or with pale areas, veins conspicuous. .... 6
5. Aedeagus, fig. 248, in lateral view broadened at apex and directed dorsally. .... 31. *luteolus*  
Aedeagus, fig. 250, narrower, pointed at



Figs. 248-262.—*Scaphoideus*, male genitalia; both internal and external structures shown. A, ventral aspect; B, lateral aspect.



- apex and curved slightly ventrally . . . . . **1. tergatus**
6. Elytra transversely banded, milky white, faintly marked with brown almost to apex of each clavus; dark brownish band across apex of clavus; apices of elytra smoky . . . . . **29. obtusus**  
Elytra not distinctly banded, entirely pale or mottled . . . . . **7**
7. Elytra pale in color, veins dark; dorsal portion of aedeagus, fig. 249, with a median tooth between anterior and posterior terminal processes; ventral portion of aedeagus in lateral view broadened on apical half, apex curved ventrally and pointed . . . . . **23. cinerosus**  
Elytra dark in color or with dark markings; dorsal portion of aedeagus without median apical tooth . . . . . **8**
8. Ventral process of aedeagus narrow, tapered at apex, as in fig. 252 . . . . . **9**  
Ventral process of aedeagus broader, or enlarged at apex, or both, as in fig. 254 . . . . . **10**
9. Ventral aedeagus process, fig. 253, narrow throughout its length, apex gently curved ventrally . . . . . **27. immistus**  
Ventral aedeagus process, fig. 252, enlarged at base of dorsal process, tapered to slender apex, which is strongly curved ventrally . . . . . **7. camurus**
10. Face pale in color, often marked with dark arcs above . . . . . **11**  
Face black or smoky, bordered with brown or black, dark arcs sometimes concealed by coloration, or arcs pale . . . . . **13**
11. Aedeagus, fig. 254, enlarged just before bluntly pointed apex . . . . . **11. auctus**  
Male aedeagus not enlarged at apex, as in fig. 255 . . . . . **12**
12. Pygofer truncate at apices; aedeagus, fig. 256, slightly curved downwardly at apex . . . . . **6. curvatus**  
Pygofer rounded at apices; aedeagus, fig. 255, one-fourth longer, more narrowed at apex . . . . . **5. dilatus**
13. Face entirely black, except for a small white spot just below apex, arcs absent . . . . . **24. melanotus**  
Face smoky to brown, with conspicuous arcs on upper portion . . . . . **14**
14. Elytra rather uniformly dark in color; scutellum conspicuously pale, dark only in basal angles . . . . . **15**  
Elytra with numerous pale markings or areas; scutellum with dark markings other than on basal angles . . . . . **16**
15. Aedeagus, fig. 258, with ventral portion enlarged at junction of dorsal process and again at apex, the latter curved ventrally and bluntly pointed . . . . . **10. pullus**  
Ventral portion of aedeagus, fig. 261, almost uniform in size throughout, slightly narrowed on upper surface just before apex, which is obliquely sloping to ventral blunt apex . . . . . **28. sensibilis**
16. Pygofer blunt, broadly rounded; ventral portion of aedeagus, fig. 262, almost uniform in size throughout, apical portion curved ventrally, apex truncate, with a pointed ventral projection . . . . . **8. flexus**  
Pygofer more elongate, bluntly pointed; ventral portion of aedeagus, fig. 260, narrowed on median half, apex obliquely sloping, with a pointed tooth on upper margin and an elongate, more acutely pointed ventral apex . . . . . **9. radix**
17. Face black or dark brown, with pale arcs beneath margin of vertex; dorsal portion of aedeagus, fig. 257, constricted just before divergent apical processes . . . . . **14. nigrellus**  
Face pale, often conspicuously yellow and with dark arcs . . . . . **18**
18. Entire dorsal surface pale; veins dark, a few dark markings on elytra; apices of elytra brown or smoky . . . . . **30. opalinus**  
Darker in color, brownish or heavily marked with brown . . . . . **19**
19. Vertex and scutellum conspicuously light, faintly marked; elytra dark brown to black, white commissural spot on each elytron conspicuous; ventral portion of aedeagus, fig. 264, very short . . . . . **4. scelestus**  
Vertex and scutellum darker or more heavily marked; commissural spot on each elytron not conspicuously white; ventral portion of aedeagus longer, as in fig. 275 . . . . . **20**
20. Ventral aedeagus process, fig. 275, not as long as dorsal process; apex of each pygofer rounded . . . . . **25. littoralis**  
Ventral aedeagus process, fig. 265, longer than dorsal process; apex of each pygofer more pointed . . . . . **13. diutius**
21. Orange yellow or orange red in color . . . . . **22**  
Some shade of brown, marked with dark brown or black . . . . . **23**
22. Length not over 5 mm.; vertex almost uniform orange yellow, without median transverse band; margin of vertex white, with a black marginal line above and another below . . . . . **12. baculus**  
Length more than 6 mm.; vertex white to yellow, with an orange transverse band . . . . . **33. ochraceous**
23. Pygofer unusually long, narrowed, and rather sharply pointed apically, as in fig. 273 . . . . . **24**  
Pygofer normally produced, rounded, or truncated . . . . . **25**
24. Aedeagus, fig. 276, in ventral view with broad processes that bear large chelate-like structures at apices . . . . . **18. chelus**  
Aedeagus, fig. 273, in ventral view with processes that taper to form long slender apically curved structures that cross each other . . . . . **16. elongatus**
25. Aedeagus, fig. 270, in lateral view with basal portion decidedly wider than apical portion . . . . . **2. frisoni**  
Aedeagus in lateral view with basal portion not wider than apical portion . . . . . **26**
26. Apical processes of male aedeagus, fig. 267, in ventral view appearing flat, about the same width throughout, evenly curved, rather abruptly narrowed to pointed apices . . . . . **3. merus**  
Apical processes of male aedeagus in ventral view unevenly curved or gradu-

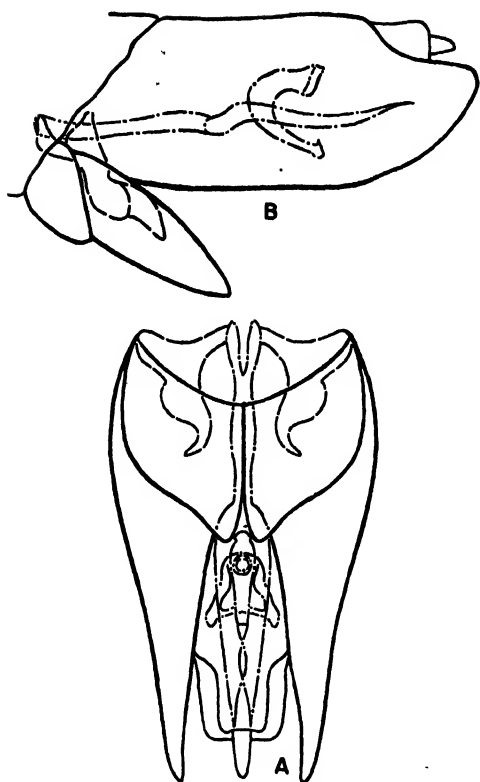
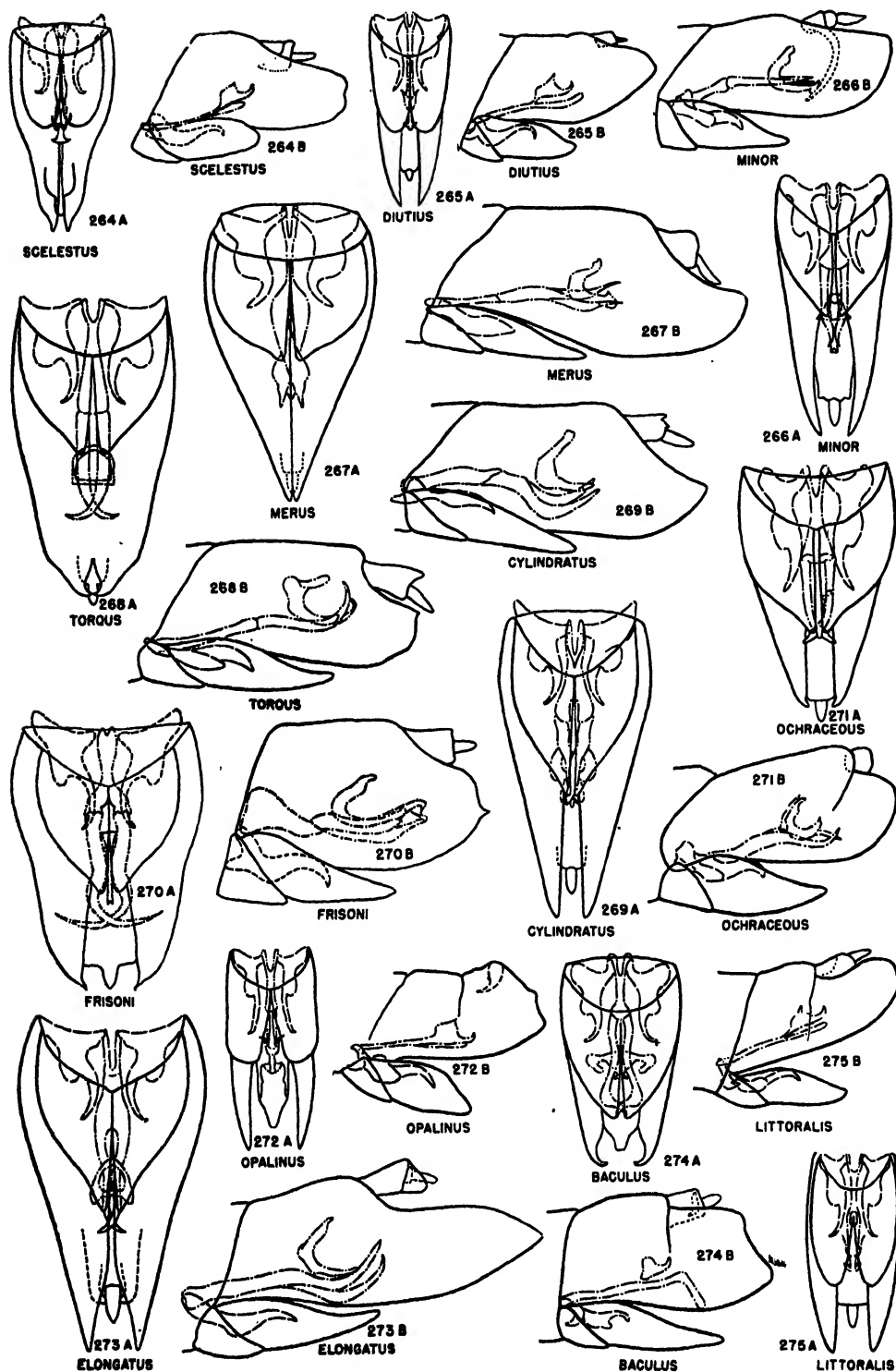


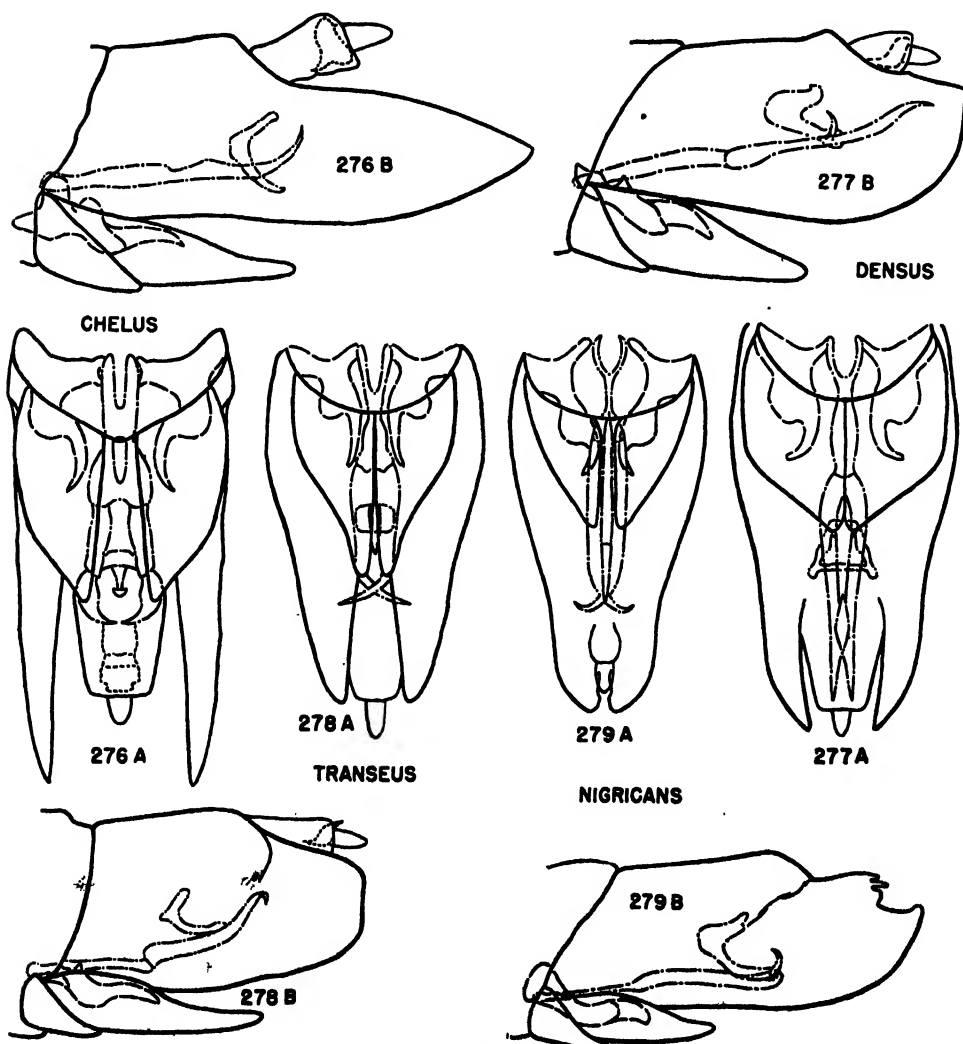
Fig. 263.—*Scaphoideus major*. A, ventral aspect, and, B, lateral aspect of male genitalia, both internal and external structures.

- ally tapered to more acutely pointed apices. .... 27
27. Apexes of ventral processes of aedeagus in ventral view long, slender, crossing each other, tips directed laterally, as in fig. 279. .... 28
- Apexes of ventral processes of aedeagus usually blunt, or if acutely pointed they are directed caudad and not crossed at apexes, as in fig. 269. .... 30
28. Vertex bluntly angled, almost rounded, heavily marked with black; transverse bands of vertex black. .... 22. *nigricans*
- Vertex more strongly produced, marked with brown; transverse band on vertex some shade of red or orange. .... 29
29. Aedeagus, fig. 278, widened near base in ventral view, gradually tapering to long slender apex. .... 19. *transeus*
- Basal two-thirds of aedeagus, fig. 268, about the same width in ventral view, apical third gradually tapering. .... 15. *torqus*
30. Aedeagus, fig. 269, with ventral processes in ventral aspect unevenly curved, apexes bluntly pointed; male plates long and narrow. .... 17. *cylindratus*
- Ventral processes of aedeagus rather evenly curved, apexes acutely pointed; male plates shorter and broader, as in fig. 266. .... 31
31. Ventral processes of aedeagus enlarged on inner margins about one-third the distance from their apexes, outer margins straight, as in fig. 277. .... 32
- Ventral processes of aedeagus, fig. 266, not enlarged between base and apex, apical fourth gradually narrowed and curved slightly inwardly to sharply pointed appressed apexes. .... 32. *minor*
32. Ventral portion of aedeagus, fig. 277, one-half longer than connectives; dorsal aedeagus process broad at base and with short thick apical portion, which is rounded at apex and bears a conspicuous dorsal spine. .... 20. *densus*
- Ventral portion of aedeagus, fig. 263, only slightly longer than connectives; dorsal aedeagus process semicircular and tapered to apex, which is blunt, slightly enlarged, and bears a small dorsal spine. .... 21. *major*
33. Vertex orange or with a bright orange transverse band. .... 34
- Vertex brown or marked with brown. .... 35
34. Face and vertex almost uniform orange. .... 12. *baculus*
- Vertex pale, with a bright orange transverse band; pronotum and scutellum mottled with orange. .... 33. *ochraceus*
35. Elytra appearing banded, each with anterior portion almost to tip of clavus white, posterior portion dark brown. .... 29. *obtusius*
- Elytra not appearing banded. .... 36
36. Elytra almost plain brown in color, each with a few pale markings. .... 37
- Elytra light in color, or each with numerous pale markings. .... 38
37. Elytra uniform brown, without dark markings. .... 31. *luteolus*
- Elytra brown, each with a few dark markings on clavus. .... 1. *tergatus*
38. General appearance light gray or white, with few dark markings. .... 39
- General appearance brown, mottled with white. .... 40
39. White, with dark veins and a few dark spots on elytra. .... 23. *cinerosus*
- White, elytra without dark veins and with a few pale spots. .... 30. *opalinus*
40. Face usually dark brown to black. .... 41
- Face usually pale, light brown, or dusky. .... 43
41. Vertex sharply pointed, heavily marked with black, and with a broad black band. .... 14. *nigrellus*
- Vertex more bluntly angled, marked with brown; transverse band brown or tawny. .... 42
42. Transverse band of vertex broad, brown in color. .... 6. *curvatus*
- Transverse band narrow, pale tawny in color. .... 24. *melanotus*
43. Transverse band on vertex usually narrow. .... 44
- Transverse band on vertex usually broad, often involving posterior half of vertex. .... 49
44. Face pale yellow; vertex, pronotum, and scutellum pale; narrow pale band on vertex. .... 4. *scolecus*



Figs. 264-275.—*Scaphoideus*, male genitalia; both internal and external structures shown. A, ventral aspect; B, lateral aspect.

- Face usually pale brown or dusky; pronotum or posterior portion of pronotum brown.....45
45. Length not more than 5.5 mm.....46  
Length usually 6.0 mm. or more.....48
46. Anterior half of pronotum usually pale; band on vertex tawny, appearing to lack a middle toothlike marking.....10. *pullus*  
Pronotum usually brown; vertex band with a central toothlike marking....47
47. Vertex band brown.....9. *radix*  
Vertex band tawny.....11. *auctus*
48. Vertex short, almost rounded at apex, conspicuously marked with black.....22. *nigricans*  
Vertex bluntly angled at apex.....17. *cylindratus*, 18. *chelus*
49. Length 6.5 to 7.0 mm.; female seventh sternite produced and angled at middle, lateral angles absent....26. *productus*
- Length smaller, or with lateral angles conspicuous.....50
50. Marginal black line above apex of vertex heavy, usually broken at middle and intensified either side of break; line often reduced to spots.....51  
Marginal line usually narrower, continuous at margin, not heavier at apex....54
51. Length less than 6 mm.....52  
Length 6 mm. or more.....53
52. Basal half of vertex usually brown; elytra heavily marked with brown.....32. *minor*  
Basal half of vertex usually pale; elytra with lighter brown markings.....19. *transeus*
53. Vertex sharp pointed, ends of broken marginal line usually reduced to spots at apex.....15. *torques*  
Vertex more bluntly angled, ends of broken marginal line usually reduced to spots



Figs. 276-279.—*Scaphoideus*, male genitalia. A, ventral aspect; B, lateral aspect.

- which often merge with projecting tooth on transverse band.....  
 .....21. *major*, 3. *merus*, 2. *frisoni*, 20. *densus*, 16. *elongatus*  
 54. Length not over 5.5 mm.....55  
 Length 5.5 mm. or more.....  
 5. *dilatatus*, 7. *camurus*, 28. *sensibilis*  
 55. Toothlike mark on transverse band minute.....  
 .....13. *diutius*, 27. *immistus*  
 Toothlike mark on transverse band larger.....  
 .....8. *flexus*, 25. *littoralis*

### 1. *Scaphoideus tergatus* DeLong

*Scaphoideus tergatus* DeLong (1939a, p. 45).

Length 5.5–6.0 mm. Similar to *luteolus*, but elytra more spotted with pale areas. Vertex white, with a very narrow marginal line, slightly interrupted at middle, and with a broad testaceous transverse band between anterior margins of eyes; band scarcely produced at middle. Pronotum testaceous, with a white transverse band on middle. Each elytron dark brown, with a few pale areas; veins on clavus indistinct, veins on corium and costa brown, apical portion black.

Female seventh sternite with apical third of posterior margin produced in a short broad rounded black tooth. Male aedeagus, fig. 250, in lateral view with ventral portion narrow, widened at junction of dorsal portion; apex gradually narrowed to pointed tip, which is slightly curved ventrally.

This species is known only from Illinois. A few specimens were taken in low flood-plain woods in a very moist habitat.

Illinois Records.—JONESBORO: state forest, July 31, 1934, DeLong and Mohr, 1 ♂, 1 ♀. HAVANA: Aug. 30, 1917, 1 ♀.

### 2. *Scaphoideus frisoni* DeLong & Mohr

*Scaphoideus frisoni* DeLong & Mohr (1936, p. 975).

Length 6 mm. Vertex white, with dark line above front margin interrupted at middle and widened either side of apex. Transverse fuscous band with central portion produced, ends sloping anteriorly. Scutellum pale, basal angles darker. Elytra white, mottled with brown, veins and apex of each dark brown.

Female seventh sternite broadly and roundedly produced and slightly keeled at middle. Male plates about as long as combined basal width, convexly rounded on basal portion, concavely rounded to form blunt pointed apices. Aedeagus, fig. 270, with a pair of long processes arising near

base, in ventral view separated near base, almost contiguous near middle, then again separated and crossing each other so that the apical fourth of each is directed laterally and is slender and tapered at apex. A broad dorsal tooth on apex of each pygopher.

This species was found on herbaceous plants in woodland areas in northern Illinois. Its distribution in the United States is decidedly northern.

Illinois Records.—ANTIOCH: Aug. 24, 1935, DeLong & Ross, 1 ♀. PALOS PARK: Aug. 8, 1935, DeLong & Ross, 1 ♀.

### 3. *Scaphoideus merus* DeLong & Beery

*Scaphoideus merus* DeLong & Beery (1936, p. 336).

Length 6.5–7.0 mm. Resembling *carinatus* Osborn (1900a, p. 201) in size and general appearance but with distinctive male genitalia. Vertex strongly produced, apex bluntly angled, almost as long as basal width between the eyes. Face pale, with two heavy dark bands below margin of vertex. Marginal line above vertex broken at middle and widened on either side of apex; median transverse band on vertex decidedly notched either side of central anterior produced portion, causing it to appear trilobate anteriorly. Pronotum and scutellum dark brown, mottled. Elytra white, washed with pale brown; veins, margins at apices, and a spot on center of each clavus dark brown.

Female seventh sternite with prominent lateral angles, posterior margin black, almost truncate, slightly emarginate either side of middle. Male plates short and broad, length equaling combined basal width, convexly rounded to form blunt apices. Styles, fig. 267, abruptly narrowed at two-thirds their length to form narrow processes that are bent strongly outward and produced. Aedeagus in ventral view with a pair of short broad flat processes arising near the base, curved so as to leave an opening between them at base, but overlapping at apices; dorsal process with the apical portion rather broad, rounded at apex, and with a dorsal pointed tooth.

This species has previously been recorded from the District of Columbia and Pennsylvania only.

Illinois Records.—JUSTICE: in woods, July 23, 1937, Mohr & Burks, 2 ♂. SKY-

MOUR: in woods, July 7, 1937, Mohr & Burks, 1 ♂. VOLO: in bog, Aug. 22, 1937, Burks & Ross, 1 ♂.

#### 4. *Scaphoideus scelestus* DeLong & Mohr

*Scaphoideus scelestus* DeLong & Mohr (1936, p. 974).

Length 5–6 mm. Superficially resembling *melanotus* in color. Face pale, with two complete dark lines and broken arcs on upper portion. Vertex, pronotum, and scutellum usually pale in color, transverse band between eyes narrow and pale. Elytra heavily infuscated with dark brown or black, anterior half of each appearing uniformly black without areoles; two milky white areoles on middle of each clavus, and a few in antepical cells.

Female seventh sternite roundedly produced and black margined. Male plates broadly rounded at apexes. Aedeagus, fig. 264, in lateral view with basal portion slender and straight; dorsal process arising near apex, with a point at base; apex with a long dorsally curved finger-like process on caudoapical extremity.

This species has been taken in small numbers from herbaceous vegetation in Illinois. It was described from Pennsylvania.

Illinois Records.—METROPOLIS: Aug. 16, 1891, Hart 1 ♂; Aug. 17, 1891, Shiga & Hart, 1 ♂.

#### 5. *Scaphoideus dilatus* DeLong & Mohr

*Scaphoideus dilatus* DeLong & Mohr (1936, p. 966).

Length 5.5–6.0 mm. Vertex pale, the transverse, orange-red band rather broad. Pronotum dark brown, scutellum paler; Elytra brownish, apexes black, veins black; each clavus with two white very small areolar spots and three or four white spots in antepical cells. Face pale brown, with one complete line below margin of vertex.

Female seventh sternite strongly and roundedly produced and broadly margined with black. Male plates with broadly rounded apexes. Aedeagus in lateral view, fig. 255, gradually enlarged on apical third to a sharp pointed apex; dorsal process with two divergent processes at apex.

Described from Pennsylvania, this species is known from several localities in Illinois.

Illinois Records.—ANTIOCH: Aug. 24, 1935, DeLong & Ross, 5 ♀. MOMENCE: Aug.

22, 1934, DeLong & Ross, 1 ♂. VOLO: in bog, Aug. 24, 1935, DeLong & Ross, 3 ♂, 7 ♀. WHITE HEATH: June 4, 1939, J. C. Dirks, 2 ♂; July 31, 1939, J. C. Dirks, 2 specimens.

#### 6. *Scaphoideus curvatus* DeLong & Mohr

*Scaphoideus curvatus* DeLong & Mohr (1936, p. 967).

Length 5 mm. Vertex yellowish, marginal line conspicuous; median dark reddish brown transverse band between eyes rather broad and produced at middle. Pronotum dark brown, with a pale transverse band. Apical half of scutellum pale yellow. Elytra brown; veins dark brown, with very pale areas; two very small areoles near center of each clavus along commissural line.

Female seventh sternite produced, rounded at apex, and black margined. Male plates broadly rounded at apexes. Aedeagus in lateral view, fig. 256, narrowed at about half its length, then produced, and ventrally curved at apex, tip pointed; dorsal process arising from enlarged portion, broadened apically and bifurcate.

This species was described from specimens taken in southern Illinois.

Illinois Record.—NEW HAVEN, June 23, 1936, DeLong & Ross, 1 ♂, 1 ♀.

#### 7. *Scaphoideus camurus* DeLong & Mohr

*Scaphoideus camurus* DeLong & Mohr (1936, p. 967).

Length 5.5–6.0 mm. Vertex white, with a rather narrow tawny band between eyes, band slightly produced at middle. Pronotum dark, with a pale transverse band behind eyes. Elytra pale brown, veins darker, intensity of dark markings variable, with dark markings usually on apical portions at least. Face yellow, with at least two complete dark lines below margin of vertex.

Female seventh sternite slightly rounded, produced, and black margined. Male plates broadly rounded apically. Aedeagus in lateral view, fig. 252, tapered toward apex, where it is sharply bent ventrally and pointed; dorsal process enlarged at apex; anterior apical process very small, almost wanting.

This species was described from Illinois and Pennsylvania. It has been taken in small numbers in low swampy wooded areas from herbaceous vegetation.

Illinois Record.—KARNAK: June 14, 1934, DeLong & Ross, 6 ♂.

8. *Scaphoideus flexus* DeLong & Mohr

*Scaphoideus flexus* DeLong & Mohr (1936, p. 968).

Length 5.0–5.5 mm. Vertex white, with a rather broad tawny band between the eyes, band scarcely produced anteriorly. Pronotum tawny, with paler transverse band on disc. Elytra brownish, marked with darker brown and with veins darker brown. Face tawny, with dark arcs on upper portion; narrow dark line just beneath margin of vertex, below which is a white band.

Female seventh sternite with prominent angles, posterior margin concavely and roundedly produced either side of a dark margined centrally produced lobe. Male plates with blunt rounded apices. Aedeagus in lateral view, fig. 262, with apical half gradually bending ventrally, apex enlarged, truncate, with a ventrally pointed tooth on ventral margin; dorsal process bifurcate at apex and concavely rounded between tips.

Recorded from Pennsylvania, Tennessee, and Illinois, *flexus* occurs on herbaceous vegetation in woodland areas.

Illinois Records.—Many males and females, taken June 14 to September 27, are from Apple River Canyon State Park, Ashley, Dolson, Dubois, Elizabethtown, Grafton, Herod, Jonesboro, Kampsville, Kankakee, Marshall, Rock Island, Shawneetown, Urbana, Vienna, Volo, and White Heath.

9. *Scaphoideus radix* DeLong & Mohr

*Scaphoideus radix* DeLong & Mohr (1936, p. 969).

Length 4.5–5.0 mm. Vertex pale, with a fine sinuate marginal line and a narrow conspicuous transverse band between anterior margins of eyes, band slightly produced at middle and bordered with reddish brown on its posterior margin. Pronotum dark brown, black behind either eye, a white cross band on anterior portion of disc. Elytra pale, mottled with brown, veins brown; each elytron with a large brown spot at apex of first claval vein and a large spot on disc. Face pale, dusky on either side next to eyes.

Female seventh sternite with posterior margin slightly concave on either side of a

central broadly produced lobe, which is blunt at apex and slightly bifid. Male plates with apices broadly rounded. Aedeagus, fig. 260, slender on apical half to near apex, which is enlarged into a foot-shaped structure with the long pointed toe portion extending ventrally; dorsal portion with bifurcate process.

Described from Illinois, this species was found only in open woodland in the southern portion of the state.

Illinois Records.—DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♀. ELIZABETHTOWN: May 22–24, 1932, Ross, Dozier, & Park, 1 ♀. HORSESHOE LAKE: on cypress, July 11, 1935, DeLong & Ross, 1 ♀. KARNAK: July 10, 1935, DeLong & Ross, 1 ♀.

10. *Scaphoideus pullus* DeLong & Mohr

*Scaphoideus pullus* DeLong & Mohr (1936, p. 969).

Length 4.5–5.5 mm. Vertex pale yellow, with a narrow black marginal line and a narrow transverse reddish band between eyes. Pronotum paler at middle, sides darker. Elytra pale brown, heavily infuscated, and with a few pale whitish areas; each clavus appearing to have a much darker stripe along inner margin, with two paler spots on posterior half. Face pale brown, with arcs always conspicuous above.

Female seventh sternite produced and rounded. Male plates with broadly rounded apices. Aedeagus in lateral view, fig. 258, enlarged on apical fourth, curved ventrally near apex, the apex bluntly pointed on ventral side.

Known previously from the District of Columbia, Pennsylvania, and Wisconsin, this species is found also in several localities in the southern half of Illinois, and occurs in open woodland.

Illinois Records.—Males and females, collected June 9 to August 24, are from Dozier, Dubois, Eichorn, Golconda, Hardin, Karnak, Metropolis, Monticello, New Holland, and St. Joseph.

11. *Scaphoideus auctus* DeLong & Mohr

*Scaphoideus auctus* DeLong & Mohr (1936, p. 970).

Length 5 mm. Vertex pale, transverse band orange, a pale transverse band on anterior portion of pronotum and scutellum.

Elytra gray, heavily marked with dark brown or black, veins conspicuously dark. Face yellowish, with one complete dark line below margin of vertex.

Female seventh sternite strongly and roundedly produced, apex faintly notched. Male plates rounded at apices. Aedeagus in lateral view, fig. 254, enlarged at apex and obliquely sloping to form a caudoventrally directed and bluntly pointed apex; dorsal process short and broad, the concave apex forming two short thick divergent processes.

This is a rather uncommon species and occurs in Illinois in woodland areas on herbaceous vegetation. It is also known from Wisconsin and Pennsylvania.

**Illinois Records.**—NEW HAVEN: June 23, 1936, DeLong & Ross, 1 ♂. URBANA: July 1, 1889, Marten, 1 ♂; June 27, 1889, Hart, 1 ♂; July 7, 1889, Hart 1 ♂.

## 12. *Scaphoideus baculus* DeLong & Mohr

*Scaphoideus baculus* DeLong & Mohr (1936, p. 970).

Length 4.5–5.0 mm. Tawny, almost devoid of white areolar spots. Face tawny, margin of vertex white, with a black marginal line above and two conspicuous black lines below. Vertex with tawny band so broad it covers surface almost entirely but leaves a narrow anterior pale area and a broad V-shaped posterior pale area. Pronotum usually darker than vertex, with traces of a white cross band just back of eyes. Elytra tawny, almost lacking white areolar spots, veins brown; each elytron with brown spots at apex, also at apex of first claval vein, and at apex of clavus.

Female seventh sternite with posterior margin concavely and roundedly produced to form a pair of prominent black teeth separated by a V-shaped notch. Male plates narrowed to inner margins, each bluntly angled. Aedeagus, fig. 274, with apical fourth bent sharply ventrally; apical portion sometimes uniform in width and sometimes tapered to apex.

The food plant of *baculus* is not known. This species has been collected in several Illinois areas. It has been recorded from Pennsylvania and Ohio, as well as Illinois.

**Illinois Records.**—ALTON: July 19, 1932, Ross & Dozier, 1 ♂. DOLSON: July 24, 1936, DeLong & Mohr, 1 ♂. DUBOIS:

sweeping along railroad, July 9, 1909, 1 ♀. URBANA: tree trunk, July 23, 1917, 1 ♂; tree trunk, Aug. 4, 1916, 1 ♀; Aug. 8, 1916, 1 ♀; Aug. 9, 1920, Malloch, 1 ♀; Aug. 12, 1935, Burks, 1 ♂; at light, Aug. 13, 1935, H. H. Ross, 1 ♂; tree trunk, Aug. 28, 1917, 7 ♂, 4 ♀; dredge ditch, Aug. 30, 1914, 1 ♀; forestry, Sept. 3, 1916, 1 ♀.

## 13. *Scaphoideus diutius* DeLong & Mohr

*Scaphoideus diutius* DeLong & Mohr (1936, p. 972).

Length 5 mm. Resembling *immistus* in color. Vertex pale, transverse band broad, tawny, scarcely produced at middle. Face yellow. Pronotum with a rather faint transverse band back of eyes. Elytra pale, tinged with brown, veins dark brown.

Female seventh sternite with posterior margin roundedly produced and black margined. Male plates with apices broadly rounded. Aedeagus in lateral view, fig. 265, similar to that of *littoralis* but with the apical ventral processes longer than the dorsal process and the dorsal process with a more slender curved finger-like projection on posterior margin.

This species was taken in small numbers in the northern portion of Illinois in open woodland. It is known also from Pennsylvania.

**Illinois Record.**—STARVED ROCK STATE PARK: July 14, 1932, Dozier & Park, 2 ♂, 1 ♀.

## 14. *Scaphoideus nigrellus* DeLong & Mohr

*Scaphoideus nigrellus* DeLong & Mohr (1936, p. 973).

Length 4.5–5.0 mm. Black, resembling *sensibilis* in appearance. Vertex white, with a broad black transverse band between eyes, band strongly produced anteriorly and shading to brown posteriorly. Pronotum black, with an interrupted white transverse band behind eyes. Elytra brownish, heavily marked with black and with a few white areolar spots, two spots on each clavus along commissural line usually conspicuous. Venter black, face black, with three pale arcs extending up over margin of vertex.

Female seventh sternite roundedly produced. Male plates slightly narrowed to broadly rounded apices. Aedeagus in lateral



view, fig. 260, with a long slender basal portion, and a bulblike portion arising at about half its length; apical end broad, concavely excavated, the outer margins with projecting points.

Recorded only from Illinois, this is a rather abundant species in the low flood-plain woodland valleys of southern Illinois on a species of *Solidago*.

**Illinois Records.**—DANVILLE: Aug. 17, 1934, DeLong & Ross, 2 ♀. DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 3 ♂, 4 ♀; July 24, 1936, DeLong & Mohr, 15 ♂, 46 ♀. URBANA: Sept. 10, 1934, H. H. Ross, 1 ♀. WILMINGTON: Aug. 20, 1934, DeLong & Ross, 1 ♂.

15. *Scaphoideus torqus* DeLong & Beery

*Scaphoideus torqus* DeLong & Beery (1936, p. 337).

Length 6.5 mm. Vertex pale, transverse band on disc rather narrow and slightly produced anteriorly at middle. Pronotum and scutellum tawny. Elytra pale, each darker on posterior half; veins brown. Face pale brownish. Marginal line above vertex narrow, interrupted, the line below margin entire, heavy.

Male plates tapered to bluntly pointed apices. Aedeagus in ventral view, fig. 268, composed of two portions that are separated at base but curve inwardly and then cross anterior to the laterally directed apices; apical portion of dorsal process not bearing a dorsal tooth. Upper apical portion of each pygofer with a distinct tooth. The female is unknown.

Described from Pennsylvania, this species has also been taken in northern Illinois in a woodland area.

**Illinois Record.**—GRAND DETOUR: Castle Rock, July 2, 1932, Dozier & Mohr, 1 ♂.

16. *Scaphoideus elongatus* DeLong & Beery

*Scaphoideus elongatus* DeLong & Beery (1936, p. 337).

Length 6.5–7.0 mm. Vertex with median transverse tawny band narrow, strongly produced anteriorly at middle. Pronotum and scutellum brownish, mottled with white, apical half of scutellum paler. Elytra white, veins dark brown, fuscous blotches on each

elytron forming an indefinite oblique band from anterior claval area to median costal area. Face pale, slightly smoky; a slender black line just beneath margin of vertex, the one above a little broader on either side of median line, where it is broken.

Female seventh sternite almost truncate, slightly produced and slightly and concavely rounded at middle. Male plates gradually narrowed to pointed apices. Aedeagus in ventral view, fig. 273, composed of a pair of processes that taper to pointed apices, which overlap; these curved and contiguous at middle, then separated anterior to and posterior to this point. Pygofers long and pointed.

This species has been found in Virginia, Mississippi, and Illinois.

**Illinois Record.**—STARVED ROCK STATE PARK: July 14, 1932, Dozier & Park, 1 ♂.

17. *Scaphoideus cylindratus* DeLong & Beery

*Scaphoideus cylindratus* DeLong & Beery (1936, p. 338).

Length 6.0–6.5 mm. Vertex pale, transverse band narrow, pale orange in color, and slightly produced at middle. Pronotum uniform brown; scutellum paler, with darker basal angles. Elytra rather uniform dull brown, each with veins and apex darker but almost devoid of areolar spots. Face pale brown, with two contiguous lines beneath vertex margin; line above margin slightly broken at middle.

Female seventh sternite broadly and roundedly produced and black margined on central half. Male plates convexly rounded and tapered to pointed apices. Aedeagus in ventral view, fig. 269, composed of a pair of rather short broad cylindrical processes, each bluntly pointed and slightly curved upward at apex.

This species has been taken in several New England states and in Illinois.

**Illinois Record.**—URBANA: on cottonwood, July 12, 1920, Auden, 1 ♂.

18. *Scaphoideus chelus* DeLong & Beery

*Scaphoideus chelus* DeLong & Beery (1936, p. 339).

Length 6–7 mm. Vertex pale, with a rather broad and poorly defined tawny transverse band between eyes. Pronotum

and scutellum brown, the former with a paler indistinct band. Elytra brownish, veins dark brown. Face slightly tawny, a dark line just below vertex and a slender one above, the latter broken at middle.

Female seventh sternite with posterior margin slightly produced to form a median rounded lobe, which is slightly emarginate at apex. Male plates convexly rounded to blunt apices. Aedeagus in ventral view, fig. 276, with a pair of separated processes arising from basal portion; these extend caudally and bear at their apices a pair of broad, curved, pincer-like processes that taper to sharp-pointed proximal apices. Pygofers long, sharply pointed.

This species has been taken only in the southern portion of the state in open woodland on dense herbaceous vegetation. It was described from Illinois.

**Illinois Record.**—DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 1 ♂, 1 ♀.

#### 19. *Scaphoideus transeus* DeLong & Beery

*Scaphoideus transeus* DeLong & Beery (1936, p. 339).

Length 5.5 mm. Vertex white, transverse median band orange at sides, darker and produced anteriorly at middle. Pronotum and scutellum pale brown. Elytral veins, and spot on costa at middle, dark brown. Face pale, a narrow black line beneath the margin of vertex and a broader one ventrad to this; marginal line on vertex broken at middle and broadened on either side of apex.

Female seventh sternite with posterior margin slightly produced, median fourth with a rather broad shallow notch. Male plates narrowed from near base to form long pointed tips with blunt apices. Aedeagus in ventral view, fig. 278, composed of a pair of processes that are broad and proximal at base and diverge to apices of plates, where they bend inwardly, cross each other, and taper to long pointed apices.

This species is known to occur in a habitat very similar to that of *chelus* and has been taken in central and northern Illinois. It is also known from Iowa and the District of Columbia.

**Illinois Records.**—DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 1 ♂,

1 ♀. GALENA: hillside pasture, July 10, 1934, DeLong & Ross, 1 ♂.

#### 20. *Scaphoideus densus* DeLong & Beery

*Scaphoideus densus* DeLong & Beery (1936, p. 340).

Length 6.0–6.5 mm. Vertex pale, with broken marginal line, transverse tawny band narrow, obliquely sloping to margin on either side, and strongly produced at middle. Pronotum and scutellum brownish. Elytra white, washed with pale brown, each with a spot on anterior part; clavus and apex of each elytron dark brown. Face pale, with three dark lines on upper portion.

Female seventh sternite slightly produced, rounded, and black margined. Male plates with apical halves sloping to bluntly pointed apices. Aedeagus, fig. 277, more than one-third longer than connective, two branched, each arm broadened on inner margin one-third the distance from apex and tapered to a sharply pointed tip; in lateral view the aedeagus is broadened near apex, curved, and tapered to pointed tip; dorsal process bearing a dorsal spine on apical portion.

Recorded from Ohio, Quebec, and Illinois, this species has been taken at several localities in this state in open woodlands. It is closely related to *chelus*.

**Illinois Records.**—BLUFF SPRINGS: June 10, 1932, Ross & Mohr, 1 ♂. EICHORN: Hicks Branch, June 13, 1934, DeLong & Ross, 1 ♂. ELIZABETHTOWN: May 27–31, 1931, Dozier, 1 ♀; June 25, 1932, Ross, Dozier, & Park, 2 ♂, 1 ♀.

#### 21. *Scaphoideus major* Osborn

*Scaphoideus immistus* var. *major* Osborn (1900a, p. 205).

Length 6.0–6.5 mm. Vertex strongly produced, bluntly angled, almost as long at middle as basal width between eyes; a brown band just below ocelli, and another just above, broken at middle; transverse band tawny, notched on either side of a broad median tooth, which extends almost to marginal band. Elytra long, broadly rounded at apex; subhyaline, with dark veins, apical margins brownish.

Female seventh sternite slightly produced and slightly but broadly notched at middle; faintly concave on either side of median third. Male plates not quite as long as

combined basal width, strongly and convexly rounded to bluntly pointed apices. Styles, fig. 263, tapered from base, each strongly and suddenly narrowed on outer margin to form on the apical fifth a short outwardly curved finger-like process. Aedeagus about the length of the connective, two branched, each branch in ventral view appearing broadened on inner margin about one-third the distance from apex and tapered to pointed tip; in lateral view aedeagus appearing tapered to a long attenuated pointed apex; dorsal process semicircular, tapered to apex, which is blunt, slightly enlarged, and with a very small dorsal spine.

This species was described from Iowa.

**Illinois Records.**—ALTON: June 26–27, 1934, DeLong & Ross, 2 ♂. APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 1 ♂. URBANA: Aug. 5, 1889, Hart, 1 ♀; Aug. 28, 1890, Hart & Shiga, 2 ♀; Aug. 10, 1891, Hart & McElfresh, 2 ♀; Aug. 29, 1891, 1 ♀.

## 22. *Scaphoideus nigricans* Osborn

*Scaphoideus nigricans* Osborn (1911, p. 258).

Length 6.0–6.5 mm. Vertex broad, white, marginal band interrupted at middle; median transverse band dark brown, narrow, sinuate, produced anteriorly at middle, forming a broad tooth, and curved posteriorly on either side. Pronotum pale anteriorly, darker posteriorly. Elytra white, veins reflexed, costal veinlets and spots in several cells brown. Face pale, smoky above, a heavy black line beneath vertex margin.

Female seventh sternite angularly produced. Male plates tapered from bases to bluntly pointed apices. Aedeagus, fig. 279, two branched, processes long, curved inwardly, crossed near apex and tapered to pointed tips; in lateral view the processes curve upward and anteriorly.

Recorded first from North Carolina and Tennessee, this species has since been taken at two localities in central Illinois.

**Illinois Records.**—URBANA: cottonwood, July 12, 1920, F. K. Auden, 1 ♀. WHITE HEATH: June 4, 1939, J. C. Dirks, 1 ♀.

## 23. *Scaphoideus cinerosus* Osborn

*Scaphoideus cinerosus* Osborn (1900a, p. 208).

Length 4.0–4.5 mm. Ashy gray, with faint marking. Vertex almost white, with

a faint brownish cross band between the eyes, and a very faint marginal line. Pronotum light gray, with brownish spots on posterior portion. Elytra with veins brown, and pale brownish spots on discal, inner anteapical, and apical cells.

Female seventh sternite roundedly produced. Male plates broadly rounded at apices. Aedeagus in lateral view, fig. 249, enlarged at about one-half its length, then constricted; apical third broadened, apex curved on dorsal portion to a ventrally sharp-pointed tip; dorsal process enlarged at apex, with anterior and posterior processes and a median sunken tooth.

This species has been taken in small numbers in Illinois in woodland areas. It is known also from Iowa.

**Illinois Records.**—URBANA: June 7, 1889, C. A. Hart, 1 ♂; Aug. 18, 1892, C. A. Hart, 4 ♀; June 23, 1918, 1 ♂; cottonwood, June 12, 1920, C. P. A., 1 ♀; Aug. 9, 1920, J. R. Malloch, 1 ♀; Aug. 15, 1940, 1 ♂.

## 24. *Scaphoideus melanotus* Osborn

*Scaphoideus melanotus* Osborn (1900a, p. 206).

Length 5 mm. Pale brown, with a black face having one minute white point just below apex of vertex and one on tip of clypeus. Vertex whitish, with a rather faint narrow brownish band, darker at center; marginal line narrow. Pronotum whitish, with anterior and posterior fulvous bands. Elytra with whitish marginal lobes on each clavus and spots on costal and post-nodal cells, fig. 228. Fulvus and fuscous markings as in *immistus*, to which this species is rather closely related.

Female seventh sternite roundedly produced and medially notched. Male plates with broadly rounded apices. Aedeagus in lateral view, fig. 259, broad, apex broadly and bluntly rounded; dorsal process with two short apical divergent processes. Pygofer each with a pair of spines at base, spines large and turned upward.

An inhabitant of herbaceous vegetation in wooded areas, this species is known from the eastern United States and occurs as far west as Texas. Recorded eastern localities include Maryland, Pennsylvania, and Tennessee. The species is rare in Illinois.

**Illinois Records.**—DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 1 ♀. SPRINGFIELD: Sept. 25, 1934, H. H. Ross, 1 ♀.

## 25. *Scaphoideus littoralis* Ball

*Scaphoideus littoralis* Ball (1932, p. 15).  
*Scaphoideus brevidens* DeLong & Mohr (1936, p. 971).

Length 4.75–5.5 mm. Pale tawny, vertex pale, with black marginal line and transverse band behind middle tawny. Elytra opalescent, each with an apical smoky band extending to a point just before the cross nervures; nervures rusty brown; two lobate ivory spots on the commissure, and with oval spots on the claval sutures. Face pale smoky in the female, creamy in the male.

Female seventh sternite with the posterior margin roundedly produced. Male plates with rounded apices. Aedeagus in lateral view, fig. 275, with a long slender ventral process, which is bifid on apical third, the bifurcate processes not as long as the dorsal portion of the aedeagus; dorsal process broadened at apex, which is concavely rounded between a small anterior toothlike projection and a posterior finger-shaped process, the latter curving dorsally and anteriorly.

One of the most common species of the genus, *littoralis* is found abundantly throughout Illinois. It is widely distributed in the eastern states and ranges west to South Dakota.

**Illinois Records.**—Many males and females, taken May 29 to October 1, are from Adair, Algonquin, Alton, Antioch, Apple River Canyon State Park, Cedar Lake, Centralia, Champaign, Charleston, Dixon Springs, Dolson, Dubois, Elizabethtown, Fox Lake, Galena, Golconda, Grafton, Hardin, Harrisburg, Havana, Herod, Kampsville, Kankakee, Karnak, La Rue, Mahomet, Meredosia, Metropolis, Mount Carmel, Muncie, Normal, Oak Lawn, Olive Branch, Palos Park, Parker, Quincy, Rockton, Rosiclare, Springfield, Thebes, Urbana, Vienna, Volo, Wauconda, West Union, White Heath, and Zion.

## 26. *Scaphoideus productus* Osborn

*Scaphoideus productus* Osborn (1900a, p. 200).

Length 6 mm. Female heavily marked and with a strongly produced seventh sternite. Vertex yellowish, with a broad fuscous band between eyes, this band produced at middle almost far enough to meet marginal band. Pronotum yellowish, with lateral fuscous areas. Elytra whitish, with fulvous

blotches on discal and apical cells, and fuscous patches on each clavus, inner discal cell, and costal crossvein and apical vein.

Female seventh sternite produced at center and strongly keeled. The first sex of this species to be described was the male, but the type male cannot be located, and the sexes have not been associated.

This species occurs in Iowa, is widely distributed over the eastern states, and undoubtedly will be found in Illinois.

## 27. *Scaphoideus immistus* (Say)

*Jassus immistus* Say (1831, p. 306).

Length 4.75–5.5 mm. Vertex blunt, white, with a prominent black rounded marginal line; transverse band broad, dark, strongly produced at middle to form a blunt tooth, band shading to fuscous and usually covering most of the basal portion. Pronotum brown, usually with a broken pale band anterior to middle; an apical and a median lateral spot on each side white. Elytra fuscous, veins darker, apex of each elytron black; several areolar spots present. Face smoky, darker above.

Female seventh sternite roundedly produced, black margined, forming a somewhat produced lobe at center. Male plates with broadly rounded apices. Aedeagus in lateral view, fig. 253, long and slender, slightly curving ventrally, and pointed at apex; dorsal process with bifurcate processes at apex, the latter short, truncate, and divergent.

This is one of the two most common species of the genus and has been taken in considerable numbers throughout the state. It occurs abundantly in the eastern United States and ranges south and west to Texas and California.

**Illinois Records.**—Many males and females, taken June 14 to October 2, are from Algonquin, Cave in Rock, Champaign, Dubois, Fairfield, Fountain Bluff, Harrisburg, Havana, Henry, Herod, Justice, Karnak, Kinmundy, Meredosia, Metropolis, Mount Carmel, New Haven, Newton, Oakwood, Quincy, Rosiclare, Seymour, Shawneetown, Sumner, Urbana, Vienna, Volo, and White Heath.

## 28. *Scaphoideus sensibilis* Ball

*Scaphoideus sensibilis* Ball (1932, p. 14).

Length 5–6 mm. Black, marked with ivory white. Vertex ivory white, with sub-

marginal dark line; median transverse band dark brown or black, band narrow next to eyes, widened at middle, and with an acute median projection. Scutellum with a large median shield of ivory and a pair of large black spots just inside the basal angles. Elytra heavily clouded with dark brown or black, with two lobate median ivory spots and four pairs along the suture on each clavus; a hyaline spot on costa.

Female seventh sternite with posterior margin angularly produced, lateral margins of produced portion concave. Male plates long and narrow, apexes bluntly rounded. Aedeagus in lateral view, fig. 261, long with apex enlarged, obliquely sloping, bluntly pointed on ventral margin.

This species was described from Florida, and a few specimens have been taken in Illinois.

**Illinois Record.**—JONESBORO: July 31, 1934, DeLong & Mohr, 1 ♂, 2 ♀.

### 29. *Scaphoideus obtusus* Osborn

*Scaphoideus obtusus* Osborn (1900a, p. 207).

Length 5 mm. Pale, with the basal half of each elytron appearing gray, the posterior portion darker. Vertex white, with a broad fuscous band between eyes; band produced anteriorly and posteriorly at middle. Pronotum fuscous, with a median longitudinal stripe and posterior margin white. Elytra white to pale gray, the basal half of each with a few dark markings, a heavy black band across posterior portion extending cephalad to apex of clavus, giving the insect a banded appearance. Face smoky.

Female seventh sternite roundedly produced and broadly black margined. Male plates long, broadly rounded at apices. Aedeagus in lateral view, fig. 251, enlarged at one-third its length, then narrowed and produced to apex, which is enlarged, curved on dorsal surface, and forms a pointed tip on ventral margin; dorsal process bifurcate, posterior process longer than anterior process.

This species, found in small numbers in woodland habitats in Illinois, is known also from Florida, New York, and Iowa.

**Illinois Records.**—ELMIRA: Aug. 2-3, 1883, 1 ♂. THOMASBORO: July 20, 1914, 1 ♀. URBANA: on cottonwood, July 12, 1920, F. K. Auden, 2 ♂, 2 ♀; Aug. 13, 1920, 1 ♀.

### 30. *Scaphoideus opalinus* Osborn

*Scaphoideus opalinus* Osborn (1905b, p. 525).

Length 5.0-5.5 mm. Grayish brown, with an opalescent tint. Vertex white to gray, marginal line distinct, fuscous bands between eyes faint, often broken at middle and broadest next to eyes. Pronotum pale brownish, disc dull gray. Scutellum mostly white, basal angles fuscous. Elytra fuscous, opalescent, a pair of brownish spots on commissure at apex of each claval vein, between which are two rounded white or gray lobate spots; a large hyaline area on middle of each costa; apical and anteapical reflexed costal veinlets and apex black. Face pale smoky.

Female seventh sternite slightly and roundedly produced, almost truncate. Male plates narrowed, but broadly rounded. Aedeagus, fig. 272, with ventral bifurcate apical process short, not as long as dorsal portion; dorsal process abruptly enlarged at apex and lacking an anterior process at tip but with a well-developed finger-like posterior process.

This species has been found occasionally upon *Juniperus* through the southern half of the state. It has been taken also in immature stages from this plant. Previous records show its occurrence in Florida, New Jersey, and New York.

**Illinois Records.**—DIXON SPRINGS: July 9, 1935, DeLong & Ross, 2 ♂, 2 ♀. HILLSBORO: on juniper, June 26, 1934, DeLong & Ross, 7 ♂, 1 ♀. LAWRENCEVILLE: on juniper, Sept. 24, 1932, Frison & Mohr, 1 ♀. STARVED ROCK STATE PARK: July 14, 1932, Dozier & Park, 1 ♂.

### 31. *Scaphoideus luteolus* Van Duzee

*Scaphoideus luteolus* Van Duzee (1894b, p. 210).

Length 4.0-4.5 mm. Brownish, elytra with a few pale areas. Vertex white, marginal line heavy. Fuscous band between eyes broad, width almost half the length of vertex, medially produced. Pronotum almost uniformly brownish. Scutellum brownish fuscous anteriorly, paler posteriorly. Elytra brownish fuscous, veins brown, reflexed costal veinlets, apex of each elytron, and apical veins brownish; small white areolar spots just before and also posterior to cross nervures of apical cells.

Female seventh sternite roundedly pro-

duced, with a short V-shaped notch at apex. Male plates broadly rounded at apexes. Aedeagus in lateral view, fig. 248, broadened at one-third its length, somewhat narrowed at two-thirds its length, and again broadened to enlarged apex, which is produced dorsally and bluntly pointed; dorsal process slender, with two long slender bifurcate teeth.

Taken in small numbers in herbaceous woodland habitats, this species has been recorded only from the Middle West.

**Illinois Records.**—ALTON: June 26, 1934, DeLong & Ross, 1 ♂, 1 ♀. ASHLEY: Aug. 17, 1917, 1 ♂. CEDAR LAKE: in bog, Aug. 6, 1906, 1 ♂. HAVANA: July 2, 1934, DeLong & Ross, 1 ♀. MEREDOSIA: Aug. 20, 1917, 1 ♂. MONTICELLO: June 11, 1934, Frison & DeLong, 1 ♀. PANA: July 21, 1937, Mohr & Burks, 1 ♂. URBANA: on cottonwood, July 12, 1920, F. K. Auden, 1 ♂; Aug. 11, 1932, H. H. Knight, 1 ♀.

### 32. *Scaphoideus minor* Osborn

*Scaphoideus immistus* var. *minor* Osborn (1900a, p. 205).

*Scaphoideus immistus* var. *incisus* Osborn (1900a, p. 206).

Length 4.25–5.0 mm. Vertex more obtuse than in *immistus*, white to yellow, with a conspicuous marginal line and a tawny transverse band produced at middle, forming a blunt tooth. Pronotum brown, a transverse narrow white band at middle. Elytra fuscous, veins brown, marked with numerous brown spots and white areoles; apex of each elytron black margined. Face pale, with dark lines below vertex margin.

Female seventh sternite broadly and roundedly produced. Male plates convexly rounded to bluntly pointed apexes. Aedeagus in ventral view, fig. 266, with a pair of slender processes arising at base and separated for most of their length, curved inwardly, meeting at their apexes, which are sharp pointed and curved slightly outward.

Although described from Iowa as a variety of *immistus*, this species is of the form and general type of *major* but with entirely different characters. It is found in Illinois in woodland habitats.

**Illinois Records.**—Males and females, taken May 18 to October 1, are from Alton, Dolson, Golconda, Hardin, Harrisburg, Havana, Kampsville, Karnak, Meredosia, Monticello, New Holland, Pike, Urbana, Vienna, Volo, White Heath, and Zion.

### 33. *Scaphoideus ochraceous* Osborn

*Scaphoideus ochraceous* Osborn (1898, p. 242).

Length 5–6 mm. Vertex white to yellow, with a conspicuous dark marginal line; transverse band broad, ochraceous, produced forward at middle on anterior margin and indented on posterior margin. Pronotum mostly ochraceous, with a broken transverse median pale band. Elytra tawny ochraceous, veins mostly brown, with several white areoles and brown spots. Face pale yellowish.

Female seventh sternite angularly produced. Male plates tapered from near base to bluntly pointed apexes. Aedeagus in ventral view, fig. 271, with a pair of short slender processes that are separated at base, curved on apical portions, and cross each other just before apexes, the latter narrow and bluntly pointed.

A woodland species usually found in small numbers, *ochraceous* occurs in the eastern United States.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, Frison & DeLong, 1 ♀. DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 3 ♂. PALOS PARK: Aug. 8, 1935, DeLong & Ross, 1 ♀.

### 42. *LONENUS* DeLong

*Lonenus* DeLong (1939a, p. 33).

The vertex is flat and similar in general appearance to that of *Scaphoideus*. The venation also is similar to that of *Scaphoideus*. The male plates are long and rather narrow. The long narrow apical portion of each style is longer than the basal portion. The characters of the dorsal portion of the aedeagus distinguish *intricatus*, the only known species in the genus, from all species in the related genus, *Scaphoideus*.

#### 1. *Lonenus intricatus* (Uhler)

*Scaphoideus intricatus* Uhler (1889, p. 34).

Length 5.5–6.0 mm. White, with anterior portion of the elytra dark. Vertex white, with a conspicuous but interrupted marginal line; transverse band pale, broken, often with central portion wanting. Pronotum white, transverse; tawny band on posterior portion faint and broken. Scutellum white. Elytra with a large oblique dark brown area on basal half of each extending posteriorly to central anteapical cell and

extending into middle of clavus; veins on apical portion, reflexed veinlets and apical margin brown. Face white, a black spot below each ocellus, and black lines below vertex margin.

Female seventh sternite roundedly produced and black margined. Male plates, fig. 246, long, convexly curved from bases, apices bluntly pointed. Apical half of styles forming long, slender, straight processes. Aedeagus in ventral view, fig. 246, with a pair of long slender processes arising at base, curving divergently at base and crossing each other before apices; apices slender.

The only species in the genus, *intricatus* is distributed rather commonly throughout the eastern half of the United States. In Illinois, it is known only from the northern half of the state.

**Illinois Records.**—ANTIOCH: Aug. 24, 1935, DeLong & Ross, 1 ♀. APPLE RIVER CANYON STATE PARK: Aug. 22, 1935, DeLong & Ross, 1 ♂, 1 ♀. DONGOLA: Aug. 23, 1916, 1 ♀. HAVANA: Aug. 31, 1917, 1 ♀. NORTHERN ILLINOIS: 1 ♀. PALOS PARK: Aug. 8, 1935, DeLong & Ross, 1 ♀. URBANA: July 21, 1889, Hart, 1 ♀; July 29, 1934, T. H. Frison, 5 ♀; Aug. 12, 1934, T. H. Frison, 1 ♂, 4 ♀; at light, Aug. 3, 1936, H. H. Ross, 1 ♀. WARREN: Aug. 22, 1935, DeLong & Ross, 1 ♂, 1 ♀.

### 43. OSBORNELLUS Ball

*Osbornellus* Ball (1932, p. 17).

Head slightly narrower than pronotum. Vertex flat, angled in front, and forming an acute angle with face. Male plates elongate, forming filamentous processes.

The species of this genus live for the most part upon herbaceous plants in open and wooded areas. Thirty species of *Osbornellus* have been recorded for the United States; six are known to occur in Illinois and at least one other may eventually be found here.

#### KEY TO SPECIES

1. Vertex marked with orange or orange red ..... 2  
Vertex brown, not marked with orange or orange red ..... 5
2. Vertex with a transverse orange-red band ..... 3  
Vertex with two longitudinal orange spots or stripes ..... 1. *jucundus*
3. Female seventh sternite with a median notch or excavation; length of each male plate to base of attenuated portion

- one-third greater than widest portion, as in fig. 286 ..... 4
- Female seventh sternite without notch; length of each male plate to attenuated portion scarcely greater than widest portion, fig. 281 ..... 3. *rotundus*
4. Female seventh sternite with a deep narrow median notch; apical portion of each male style, fig. 285, with straight margin not notched, and without teeth ..... 2. *auronitens*
- Female seventh sternite roundedly produced either side of a broad shallow median excavation at the apex of which is a brownish longitudinal spot or a slight incision; apical portion of each male style, fig. 286, bearing a short pointed tooth on inner margin just before apex ..... 4. *limosus*
5. Vertex brown, concolorous ..... 5. *unicolor*
- Vertex not concolorous, marked with paler spots or lines ..... 6
6. Vertex dull yellow to brown, darker markings inconspicuous; median dark band between ocelli wanting ..... 6. *consors*
- Vertex white or pale, brown markings conspicuous; median darker band between ocelli conspicuous ..... 7. *clarus*

#### 1. *Osbornellus jucundus* (Uhler)

*Scaphoideus jucundus* Uhler, (1889, p. 34).

Length 5.0–6.25 mm. Tawny yellow, elytra with numerous milky white spots. Vertex marked by two longitudinal orange spots. A narrow black line just above margin of vertex and a more distinct one on upper margin of face. Female seventh sternite with posterior margin broadly and convexly rounded. Male plates slender, narrowed to long attenuate apices. Aedeagus, fig. 282, curved ventrally, narrowed to apex, where a pair of divergent apical processes arise, curve laterally and cephalad.

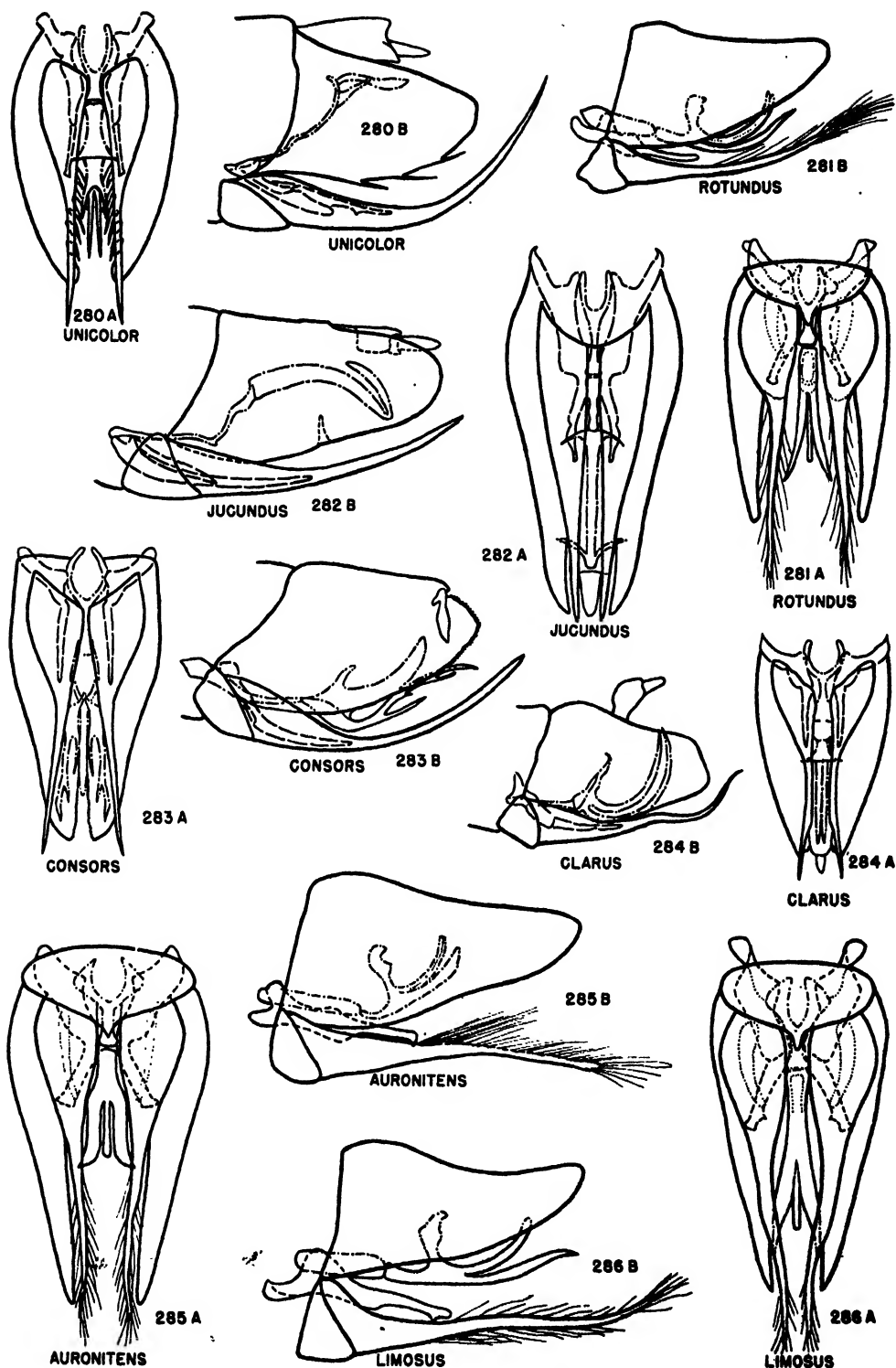
Occurring in small numbers in woodland areas on herbaceous vegetation, *jucundus* is distributed over the eastern United States and west to Missouri and Iowa.

**Illinois Records.**—ALTON: June 26, 1934, 1 ♂. ANVIL ROCK: Oct. 3, 1934, Frison & Ross, 1 ♀. HAVANA: Aug. 30, 1917, 2 ♂. HEROD: Aug. 4, 1934, DeLong & Mohr, 1 ♀. OREGON: Aug. 23, 1935, DeLong & Ross, 1 ♀. PALOS PARK: Aug. 8, 1935, DeLong & Ross, 1 ♂. TAMAROA: Sept. 22, 1882, 1 ♂ (Acc. No. 3135).

#### 2. *Osbornellus auronitens* (Provancher)

*Scaphoideus auronitens* Provancher (1889, p. 277).

Length 6 mm. Light yellow, and with a prominent orange-red transverse band; ver-



Figs. 280-286.—*Osbornellus*, male genitalia; both internal and external structures shown. A, ventral aspect; B, lateral aspect.



tex anteriorly margined with a black line; a black band on margin of vertex and another just above margin. Pronotum marked with reddish. Elytra each with three reflexed costal veinlets and three pairs of black spots along claval suture.

Female seventh sternite cleft to near its base, forming two broadly rounded lobes. Male plates elongate, triangular, with long attenuated apices. Styles with apical portion of each bent outwardly, almost parallel margined. Aedeagus in lateral view, fig. 285, curved dorsally and with a pair of broad processes arising laterally just before base of shaft, flaring slightly, apices pointed.

This is the most common species of the genus in Illinois and has been taken abundantly throughout the state. It is found in the eastern United States only.

**Illinois Records.**—Many males and females, collected from June 14 to November 17, are from Antioch, Apple River Canyon State Park, Bloomington, Channel Lake, Dixon Springs, Dolson, Elizabethtown, Fox Lake, Grand Tower, Herod, Hopedale, Kankakee, Makanda, Marshall, Monticello, Mount Carmel, Muncie, Oakwood, Temple Hill, Urbana, Vienna, and White Heath.

### 3. *Osbornellus rotundus* Beamer

*Osbornellus rotundus* Beamer (1937, p. 93).

Length 5.0–5.5 mm. Tawny and of the same form, color, and appearance as *auronitens*, but with the female seventh sternite not cleft and vertex more acute. Vertex with three dark parallel lines and a transverse orange-red band between eyes. Pronotum with the anterior margin orange and with darker spots posteriorly. Each clavus with three dark spots on commissural suture.

Female seventh sternite with posterior margin truncate or slightly produced. Male plates long, acutely tapered, with long filamentous apices. Each style with apical half narrowed, tapering to slightly knobbed tip. Aedeagus, fig. 281, long and slender, a pair of lateral processes arising a short distance from the base and gradually tapering to sharp apices.

For many years this species has been confused with *auronitens*, which it closely resembles. It occurs on herbaceous vegetation in open woodlands, and it is widely distributed over the eastern United States.

**Illinois Records.**—DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross,

2 ♀. GRAFTON: on wild grape, July 2, 1932, Frison & Ross, 1 ♂.

### 4. *Osbornellus limosus* DeLong

*Osbornellus limosus* DeLong (1941, p. 179).

Length 5–6 mm. Resembling *auronitens* in form and general appearance but with vertex more broadened and with distinctive male and female genitalia. Vertex almost one-third wider between eyes than median length. In color similar to *auronitens*, with broad orange-red transverse band on vertex and with orange-red blotches on pronotum and basal angles of scutellum. Elytra pale brown, with veins dark brown and three pairs of brown spots along commissural line of each clavus as in *auronitens*.

Female seventh sternite with posterior margin roundedly produced on either side of a broad shallow median excavation, with a brownish longitudinal spot or slight incision at apex. Male valve, fig. 286, roundedly produced, with a median produced pointed apical tooth. Plates long and tapered to acute tips. Each style with outer margin notched just beyond middle, forming a long narrow apical finger-like process that is bent outwardly from notched portion; each style bears a short pointed tooth on inner margin just before apex. Aedeagus with a short rather broad process extending dorsally near base; apical portion consisting of a single curved dorsal process and a ventral process that is bifurcate at about its middle, forming a pair of divergent processes, which are broad at base but tapered to slender pointed apices.

This species has been recorded from New Jersey, Pennsylvania, and northern Tennessee, and may eventually be found in the southern portion of Illinois.

### 5. *Osbornellus unicolor* (Osborn)

*Scaphoideus consors* var. *unicolor* Osborn (1900a, p. 196).

Length 5 mm. Face, vertex, and pronotum uniform brown, elytra brownish hyaline, nervures dark; reflexed costal veins and apices broadly fuscous. Female seventh sternite with posterior margin almost truncate, often with an indication of a slight central tooth, on either side of which the segment is emarginate. Each male plate narrow, twice as long to attenuation as greatest width. Styles with truncate apices.

Aedeagus, fig. 280, composed of a short ventral and a longer dorsal process, each of which is bifid. Ventral margin of each pygofer with long slender caudally directed spines.

A common species on herbaeous vegetation in open woodland, *unicolor* has been recorded from the eastern United States and Texas.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 1 ♂. ELIZABETHTOWN: July 8, 1935, DeLong & Ross, 1 ♂.

#### 6. *Osbornellus consors* (Uhler)

*Scaphoideus consors* Uhler (1889, p. 36).

Length 5.5–6.0 mm. Brownish, marked with fuscous and yellowish. Lines and markings on vertex blending with and not much darker than ground color. Pronotum with a pale spot behind each eye and a pale median longitudinal line. Elytra subhyaline, pale spots on each clavus indistinct, nervures brown, apical margin and costal veinlets broadly black.

Female seventh sternite with posterior margin sinuate. Each male plate long, tip attenuate. Each style with apical two-thirds slender, straight, and tapered. Aedeagus, fig. 283, with a rather heavy body and with a pair of antler-like structures having many lateral processes arising near base and extending beyond apex of body of aedeagus.

This is a common species on herbaceous vegetation in wooded areas. Distributed through the eastern United States, it ranges west to Texas, Colorado, and Utah.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, Frison & DeLong, 4 ♂, 5 ♀. DIXON SPRINGS: July 29, 1934, DeLong & Mohr, 1 ♂. DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 12 ♂, 3 ♀. FERN CLIFF: Aug. 3, 1934, DeLong & Mohr, 1 ♀. KANKAKEE: July 20, 1934, DeLong & Ross, 1 ♂. MARSHALL: Sept. 27, 1934, Frison & Ross, 1 ♀. NORTHERN ILLINOIS: 2 ♀. PALOS PARK: Aug. 8, 1935, DeLong & Ross, 3 ♂, 1 ♀. WHITE PINES FOREST STATE PARK: Aug. 27, 1934, DeLong & Frison, 1 ♀.

#### 7. *Osbornellus clarus* Beamer

*Osbornellus clarus* Beamer (1937, p. 99).

Length 5.0–5.5 mm. Closely resembling *consors* but more distinctly marked and

without the branched aedeagus processes. Vertex with distinct white apex; margin and a median triangle just behind apex conspicuously white, these markings bordered by heavy fuscous lines; a rather definite darker area forming a banded pigmentation between the eyes. Scutellum pale, with dark basal angles. Elytra cinereous, with dark veins.

Female seventh sternite roundedly produced. Each male plate with a long slender attenuated apex. Each style with apical half slender and tapered. Aedeagus, fig. 284, with a pair of long slender curved processes arising ventrally and curving dorsally.

This species occurs on herbaceous plants in open woodland. Specimens of this species, collected in the eastern United States, have for many years been listed under the name *scalaris* Van Duzee; *scalaris* is a species distributed only in the southwestern United States.

**Illinois Record.**—DUNCANS MILLS: near Spoon River, Oct. 20, 1941, 1 ♀.

#### 44. *PRESCOTTIA* Ball

*Prescottia* Ball (1932, p. 16).

Fig. 215. Head narrower than pronotum; vertex angular, broad and flat or concave, with a sharp margin acutely angled with front. Elytra each with outer anteapical cell, fig. 215, parallel with the costa; about four or five reflexed veinlets to costa and an equal number along costal area; cells anterior to the apical ones more or less reticulate, especially along claval suture.

Two described species belong to this genus, one of which occurs in the eastern United States and has been collected in Illinois.

##### 1. *Prescottia lobata* (Van Duzee)

*Scaphoideus lobatus* Van Duzee (1894b, pp. 199, 211).

Length 5.5–6.0 mm. Pale yellow or white, marked with black lines and spots. Vertex yellowish, with a brown line above and parallel to margin, and a transverse brown line between eyes enlarged to a spot on disc. Elytra milky white, nervures broadly brown or black and with numerous heavy and large blackish blotches or inscribed lines; brown markings on each clavus heavy, forming three distinct white lobes along commissural line on inner margin. Female seventh ster-

nite with posterior margin almost truncate, slightly notched. Male plates, fig. 293, narrow, with slender recurved tips.

This species occurs in open woods or at woodland margins upon *Solidago caesia* and probably other species of plants. Collecting would indicate it is quite restricted in regard to its food plants.

**Illinois Records.**—STARVED ROCK STATE PARK: July 14, 1932, Dozier & Park, 1 ♂. ZION: July 25, 1934, Frison & DeLong, 1 ♂; Aug. 7, 1936, DeLong & Ross, 1 ♂.

#### 45. *SANCTANUS* Ball

*Sanctanus* Ball (1932, p. 10).

Front margin of vertex round to bluntly angled, disc slightly convex, meeting front in an acute angle. Elytra each with two cross nervures between the first and second sectors; central anteapical cell constricted and divided; outer anteapical cell usually narrow at both ends, and usually having one or more reflexed veinlets to the costa as well as extra reticulations in some cells. Most species are marked by pigmented saddle patterns.

Ten species of this genus are recorded for the United States by Oman (1934) and DeLong & Knull (1945). Eight of these occur in the eastern states, and one of them has been taken in Illinois.

##### 1. *Sanctanus sanctus* (Say)

*Jassus sanctus* Say (1831, p. 307).

*Scaphoideus picturatus* Osborn (1898, p. 243).

Length 4–5 mm. White, with a brownish band across elytra. Vertex rather sharply angled, white with two minute fuscous spots near apex. Pronotum with disc somewhat fuscous. Elytra white, each with a cruciform brownish band bordered with black; band covering posterior two-thirds of each clavus, a small round white spot at middle of band on commissural line. Female seventh sternite slightly notched at middle of posterior margin. Male plates, fig. 289, rather long and slender, longer than combined basal width; apices blunt.

This species occurs commonly in the southern fifth of the state on herbaceous plants. It is one of the most conspicuously marked of the Illinois species of leafhoppers.

**Illinois Records.**—Males and females, taken June 29 to October 6, are from Cache,

Carmi, Dubois, Elizabethtown, Meredosia, Metropolis, Olive Branch, Quincy, Rosiclare, and Thebes.

#### 46. *PLATYMETOPIUS* Burmeister

*Platymetopius* Burmeister (1838, pl. 14).

Head narrow, face plain, supernumerary veinlets short and at right angles to costa. Each elytron has only one cross nervure between the sectors. The species of this genus are without vermiculate markings.

Two species are at present included in this genus for the United States and one of these occurs in Illinois. The other, *palliolatus*, is found in Texas.

##### KEY TO SPECIES

Color orange yellow, with white areolar spots ..... 1. *vitellinus*  
Color lemon yellow; pronotum and scutellum dark brown; a narrow brown stripe on each elytron along margin of scutellum and extending along suture to apex. .... 2. *palliolatus*

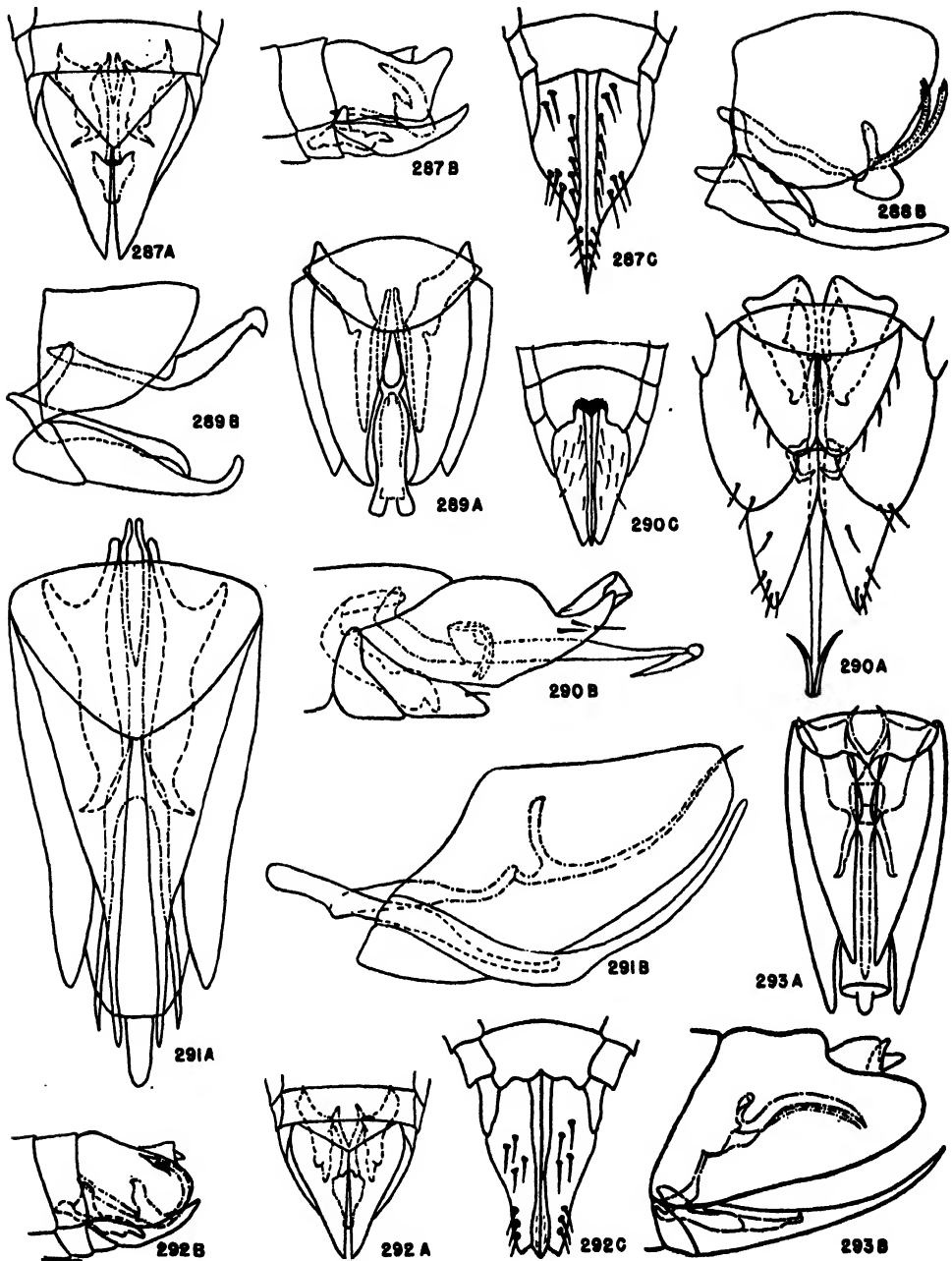
##### 1. *Platymetopius vitellinus* (Fitch)

*Acocephalus vitellinus* Fitch (1851, p. 57).

Fig. 298. Length 5.5–6.5 mm. Orange yellow, with an oblique testaceous stripe on each elytron. Vertex and face pale yellow, usually a narrow black line just below margin of vertex. Pronotum yellow anteriorly, darker posteriorly. Scutellum pale yellow, the basal angles darker. Elytra yellow, with many white spots, each with a testaceous band at base, and another testaceous oblique band parallel to it from costa to apex of clavus. Female seventh sternite, fig. 296, with the posterior margin shallowly emarginate and with a narrow blunt tooth arising from the middle, the tooth longer than its basal width and bifid at apex. Male plates, fig. 297, convexly rounded, then narrowed to acute apices.

This species occurs on herbaceous vegetation in shrubby or open woodland areas. It has been taken from wild rose, but this may not represent a definite host plant. It is transcontinental in distribution.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 1 ♀. BEACH: July 25, 1934, Frison & DeLong, 1 ♀. FREEPORT: June 27, 1935, DeLong & Ross, 1 ♂. GALENA: July 10, 1934, DeLong & Ross, 1 ♀. GRAND DETOUR: July 12, 1934, DeLong & Ross, 1 ♀.



Athysaninae, male and female genitalia. The figures illustrate chiefly some generic characters. *A*, ventral aspect of male genitalia, both internal and external structures; *B*, lateral aspect of male genitalia, both internal and external structures; *C*, female genitalia, external structures only. Internal structures indicated by broken lines.

Fig. 287.—*Exitianus obscurinervis*.

Fig. 288.—*Opsius stactogalus*.

Fig. 289.—*Sanctanus sanctus*.

Fig. 290.—*Acurhinus pyrops*.

Fig. 291.—*Japananus hyalinus*.

Fig. 292.—*Remadosus magnus*.

Fig. 293.—*Prescottia lobata*.

OAKWOOD: June 18, 1926, Frison & Hayes, 1 ♂. WAUKEGAN: May 14, 1930, Frison & Ross, 2 ♀.

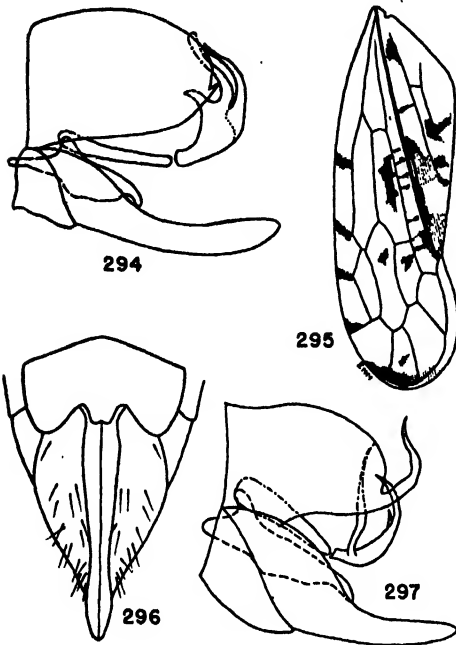


Fig. 294.—*Mesamia nigridorsum*, lateral aspect of male genitalia.

Fig. 295.—*Mesamia nigridorsum*, elytron.

Fig. 296.—*Platymetopius vitellinus*, female genitalia.

Fig. 297.—*Platymetopius vitellinus*, lateral aspect of male genitalia.

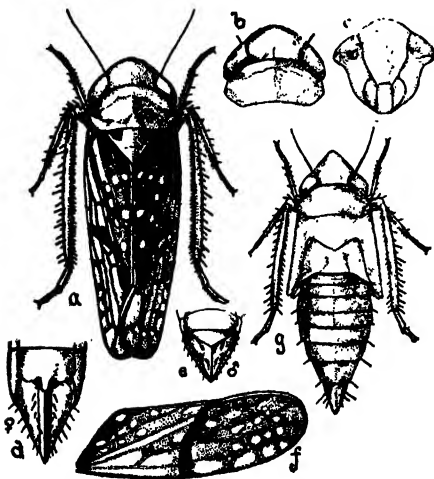


Fig. 298.—*Platymetopius vitellinus*: a, adult; b, head and pronotum; c, face; d, female genitalia; e, male genitalia; f, elytron; g, nymph. (From Osborn.)

## 2. *Platymetopius palliolatus* (Ball)

*Eutettix palliolata* Ball (1902a, p. 13).

Length 5–6 mm. Pale lemon yellow, tinged with greenish or brown. Pronotum, scutellum, and a narrow sutural stripe extending to apex of elytra dark brown; anterior portions of stripes often narrowly margined with white; brown stripe often contains smaller white spots. Face pale yellow, straight in lateral view. Vertex rather strongly produced and bluntly angled, about one and one-half times as wide between eyes at base as median length. Vertex flat, with a sharp margin.

Female seventh sternite truncate posteriorly, with a median produced blunt tooth notched at apex, tooth occupying the median fourth of segment and half as long as basal width. Male plates rather long, apices bluntly rounded. Styles gradually tapering from bases to blunt apices. Each pygofer with a spine arising ventrally at about the middle on either side and extending beyond apex. Aedeagus short, rather broad at base, narrowed to bifid apex, curved dorsally, then anteriorly.

This species is known only from Texas.

## 47. *JAPANANUS* Ball

*Japananus* Ball (1931c, p. 218).

Fig. 211. This genus is described as similar to *Platymetopius* in having the single cross nervure and the vermiculate markings. Vertex rather long and acute; elytra each with few or no veinlets to the costa. The latter character is probably the best one to use in separating it from the closely allied genera.

The only species known in this genus is an Oriental importation and occurs commonly upon maples in Illinois. Thus far in the United States, it is known to occur in the eastern part only.

### 1. *Japananus hyalinus* (Osborn)

*Platymetopius hyalinus* Osborn (1900d, p. 501).

Length of male 4.5 mm., female 5.5 mm. Face bright yellow, vertex, pronotum, and scutellum gray to green, tinged with bright yellow and smoky, often with pale longitudinal stripes on middle and from disc of vertex to eyes. Elytra hyaline, veins dark, a narrow, broken band of brownish spots

across anterior portion of each clavus, another across apex, and a third crossing apical portion of each elytron at apical crossveins.

Vertex in female more than twice as long as basal width between the eyes, deeply furrowed longitudinally. Male with vertex more blunt, about one and one-half times as long as basal width between the eyes, disc deeply depressed. Pronotum short and broad in both sexes, more than twice as wide as median length, eyes extending over anterior margin rather deeply on each side.

Female seventh sternite concavely produced for more than twice its length on posterior margin to form a long broad pointed tooth reaching two-thirds the length of pygofer. Male plate, fig. 291, long, triangular on basal half, then narrowed to form narrow attenuate tip, which is produced about the length of the basal half.

**Illinois Records.**—ALTON: July 19–21, 1932, Ross & Dozier, 11 ♂, 13 ♀; June 27, 1934, DeLong & Ross, 4 ♂. JACKSONVILLE: Aug. 23, 1943, 1 ♂, 1 ♀. MONTICELLO: Sept. 22, 1934, H. H. Ross, 1 ♀. OAK LAWN: in lamp globe, Aug. 22, 1934, 1 ♀. URBANA: Aug. 10, 1932, H. H. Ross, 3 ♀; Aug. 10, 1932, H. H. Knight, 1 ♂, 1 ♀; Sept. 7, 1934, Ross & Townsend, 3 ♂, 1 ♀; Aug. 28, 1934, Ross & Townsend, 3 ♀.

#### 48. *SCAPHYTOPIUS* Ball

*Scaphytopius* Ball (1931c, p. 218).

Vertex flat, eyes large, deeply set into pronotum. Pronotum broader than head, venation regular, with two crossveins. Male genitalia with a single heavy portion that is bifid at apex.

Only one species, *elegans*, with three varieties, is known to occur in the United States. It is recorded from California, Arizona, and Florida.

##### 1. *Scaphytopius elegans* (Van Duzee)

*Platymetopius elegans* Van Duzee (1890c, p. 94).

Length 4.5–5.0 mm. Pale brown, vertex margined with black anteriorly, a narrow pale median stripe at apex merging with a broad pale yellowish longitudinal stripe that extends from near apex of vertex across pronotum, scutellum, and each clavus of elytra to apex of clavus; stripe includes entire scutellum. Elytra brownish subhyaline, costal veins brown. Face dull yellow,

with a brown line above, leaving a narrow pale marginal band between the two parallel dark lines. Vertex blunt at apex, almost twice as long at middle as basal width between eyes at base.

Female seventh sternite rather broadly and roundedly produced on posterior margin. Male styles, fig. 241, with short thick apical processes that are curved outwardly. Aedeagus short and rather broad, with a pair of rather heavy divergent finger-like processes at apex.

This species is known only from Florida, Arizona, and California.

#### 49. *CLOANTHANUS* Ball

*Cloanthanus* Ball (1931c, p. 219).

Fig. 299. Vertex flat, acutely angled, longer than basal width between eyes. Gena visible behind eyes. Pronotum broader than head. Elytral venation regular, two cross nervures between sectors, and numerous short reflexed veinlets to costa. Male genitalia with a dorsal portion and a pair of long ventral processes.

This genus includes almost all of the eastern species formerly placed under *Platymetopius*. DeLong (1943, 1945) and Hepner (1946) record about 85 species and subspecies as occurring in the United States. Thirteen species have been taken in Illinois, and several more may occur here.

The structures of the male genitalia present the most reliable characters for distinguishing the species of this genus. The color characters will aid in the identification of females of some species, but they are not entirely reliable.

#### KEY TO SPECIES

1. Males.....2  
Females.....30
2. Long ventral paired processes of aedeagus slender to apices, often coiled, curved, or branched but not broadened near apices, as in fig. 300.....3  
Ventral paired processes each broadened or blade-like just before apex, often bearing a dorsal spine, as in fig. 312.....15
3. Paired processes coiled around dorsal portion of aedeagus, as in fig. 301.....4  
Paired processes extending toward caudal portion of pygofer, usually crossing each other and sometimes crossed over dorsal aedeagus portion but not coiled around it, as in fig. 302.....5
4. Vertex long, sharp; face brown; dorsal surface of body usually tinged with red.....18. *rubellus*

- Vertex shorter; face yellowish; dorsal surface of body cinereus, never brown or tinged with red.....17. *cinereus*
5. Paired aedeagus processes each bearing a distinct inner branch at about two-fifths the distance from apex, fig. 302.....6  
Paired aedeagus processes not branched, as in fig. 303.....7
6. Brownish fulvous, unmarked.....26. *fulvus*  
Brown, with a black pronotum, anterior portion of scutellum often black.....27. *collaris*
7. Ventral processes, fig. 303, crossed and bent over dorsal portion of aedeagus, then curved ventrally; color greenish brown.....16. *angustatus*  
Ventral paired processes not bent over dorsal aedeagus, but extending caudally to apices of pygofer, as in fig. 305.....8
8. Face yellow, often margined with brown.....9  
Face irrorate with brown.....13
9. Dorsal portion of aedeagus thick, rather heavy, and broadly rounded at base, as in fig. 306.....10  
Dorsal portion of aedeagus more elongate, slender, and with basal curve more V-shaped and pointed at base, as in fig. 304.....11
10. Black above, face bright yellow.....28. *frontalis*  
Grayish green, tinged with brown.....23. *parvus*
11. Vertex twice as long as basal width between eyes.....29. *slossoni*  
Vertex more than half as wide between eyes at base as median length.....12
12. Each pygofer, fig. 307, long and tapered to a narrow blunt apex; dorsal portion of aedeagus especially elongated.....19. *acutus*

- Each pygofer shorter, more rounded; dorsal portion of aedeagus shorter, as in fig. 308.....13
13. Each style, fig. 308, with long apex formed by the gradual narrowing of the outer margin beyond middle; dorsal portion of aedeagus long and sinuate.....20. *filamentus*
- Each style, fig. 309, abruptly narrowed at three-fourths its length, apical processes short; dorsal portion of aedeagus straight and thicker at base.....25. *tenuis*
14. Each pygofer, fig. 310, short, with a bluntly pointed apex on dorsal margin; ventral paired processes broadly curved ventrally and anteriorly at apices.....21. *cinnamomeus*
- Each pygofer, fig. 311, long, tapered gradually to narrow blunt apex, greatly exceeding plates.....22. *abbreviatus*
15. Blades of ventral aedeagus processes without spines on dorsal or inner surfaces, as in fig. 303.....16  
Blades of ventral aedeagus processes bearing some kind of pointed spinelike structures on dorsal or inner surface, as in fig. 315.....18
16. Blades scarcely widened on apical portion, fig. 303.....16. *angustatus*  
Blades distinctly widened, as in figs. 312, 314.....17
17. Face brown, vertex appearing banded transversely.....1. *verecundus*  
Face yellow, with darker margins, vertex not appearing banded.....2. *argutus*
18. Face and vertex pale; pronotum, scutellum, and elytra darker.....19  
Vertex brown or black, with pale longitudinal markings.....20
19. Face and vertex white; pronotum, scutellum, and elytra shiny black, with few pale spots or areoles.....14. *bicolor*

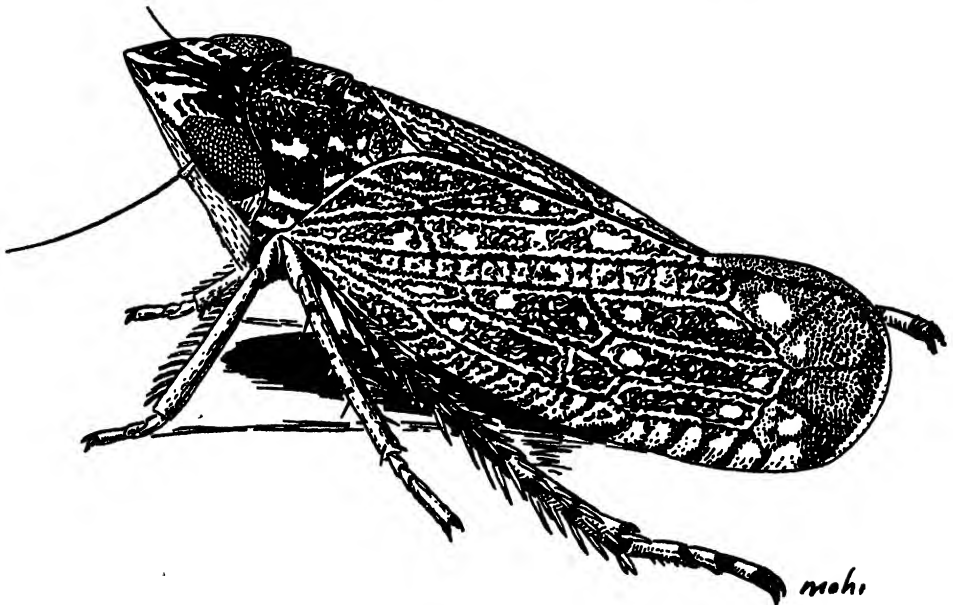
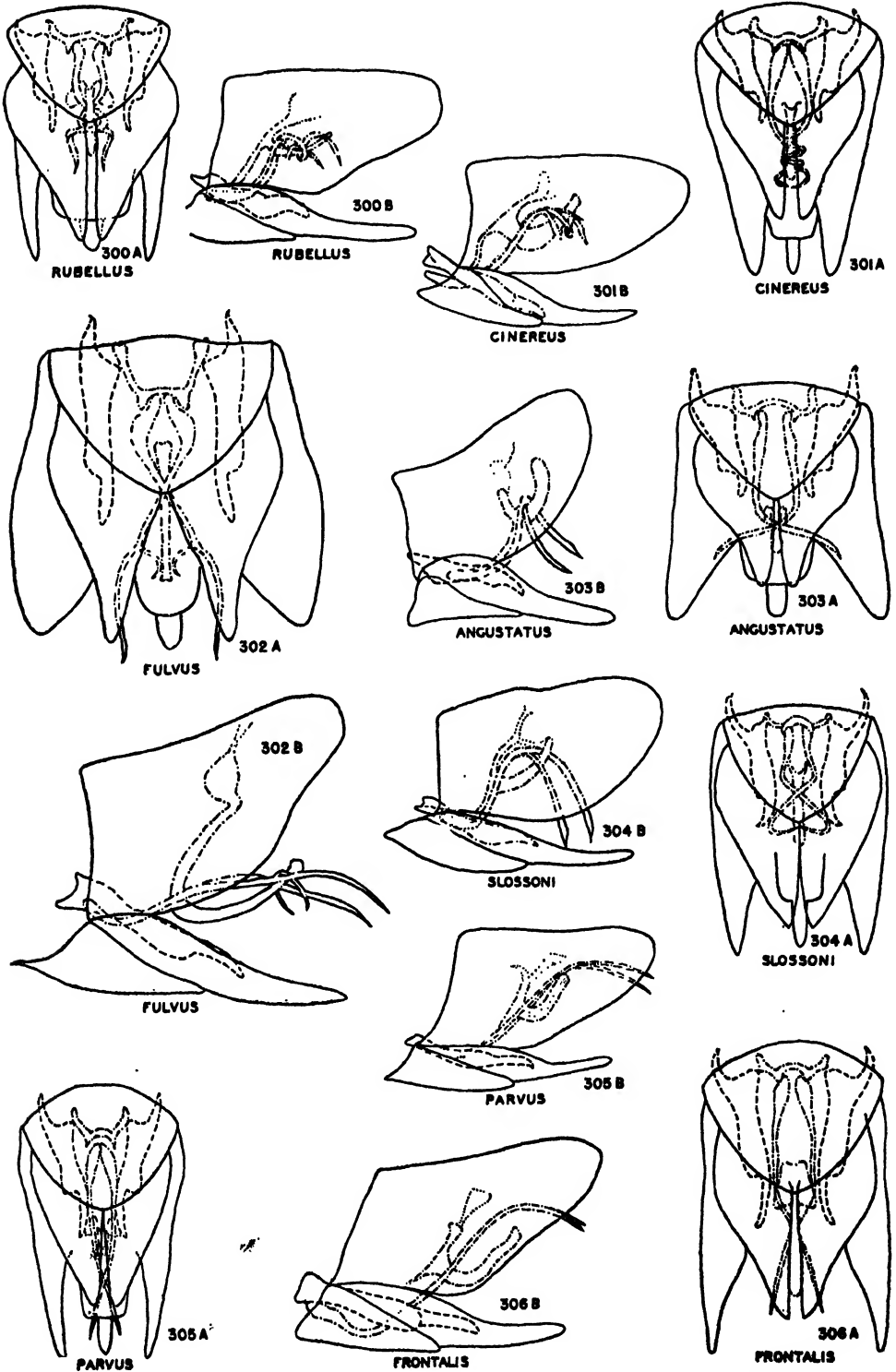
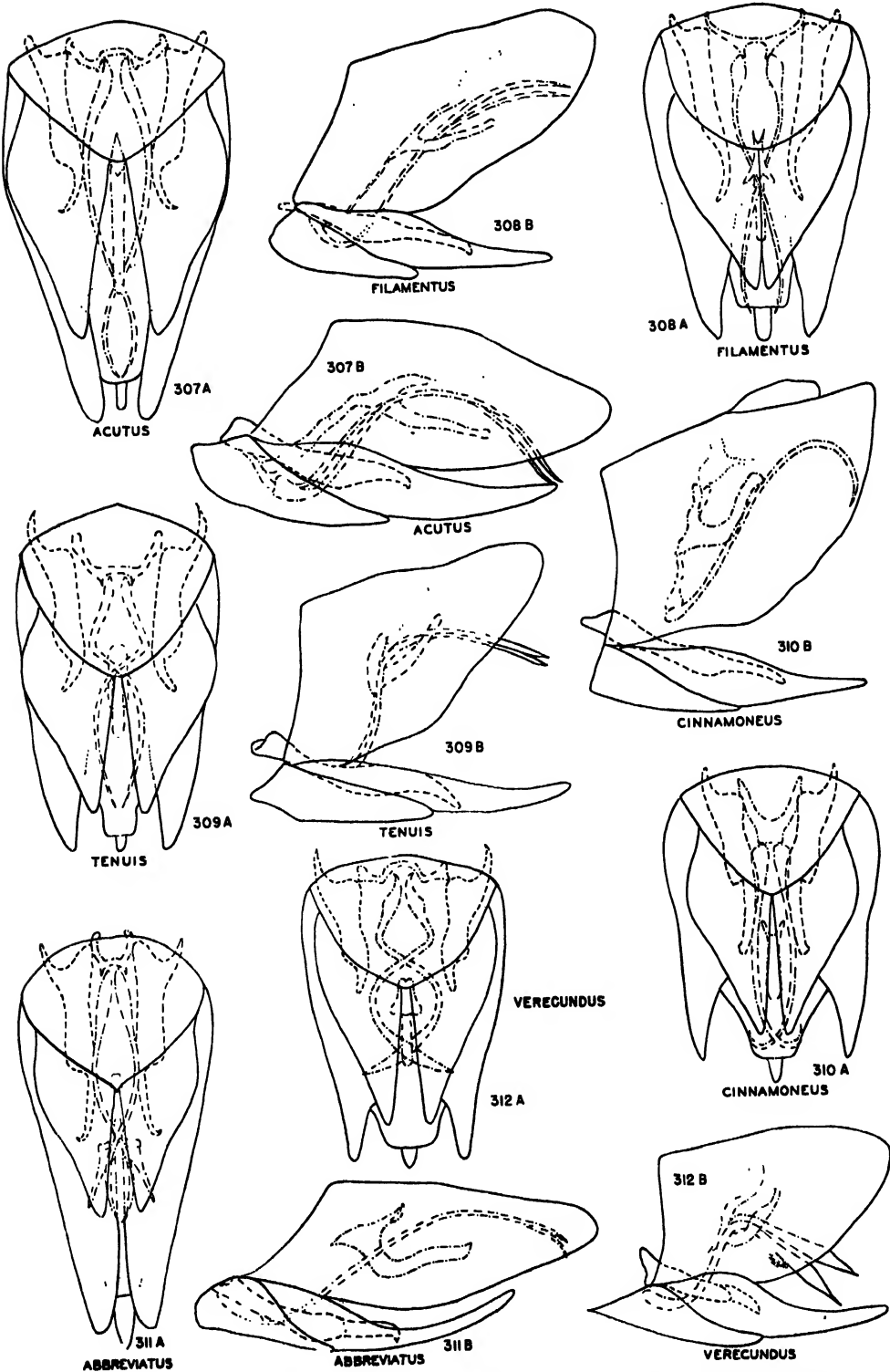


Fig. 299.—*Cloanthanus frontalis*.

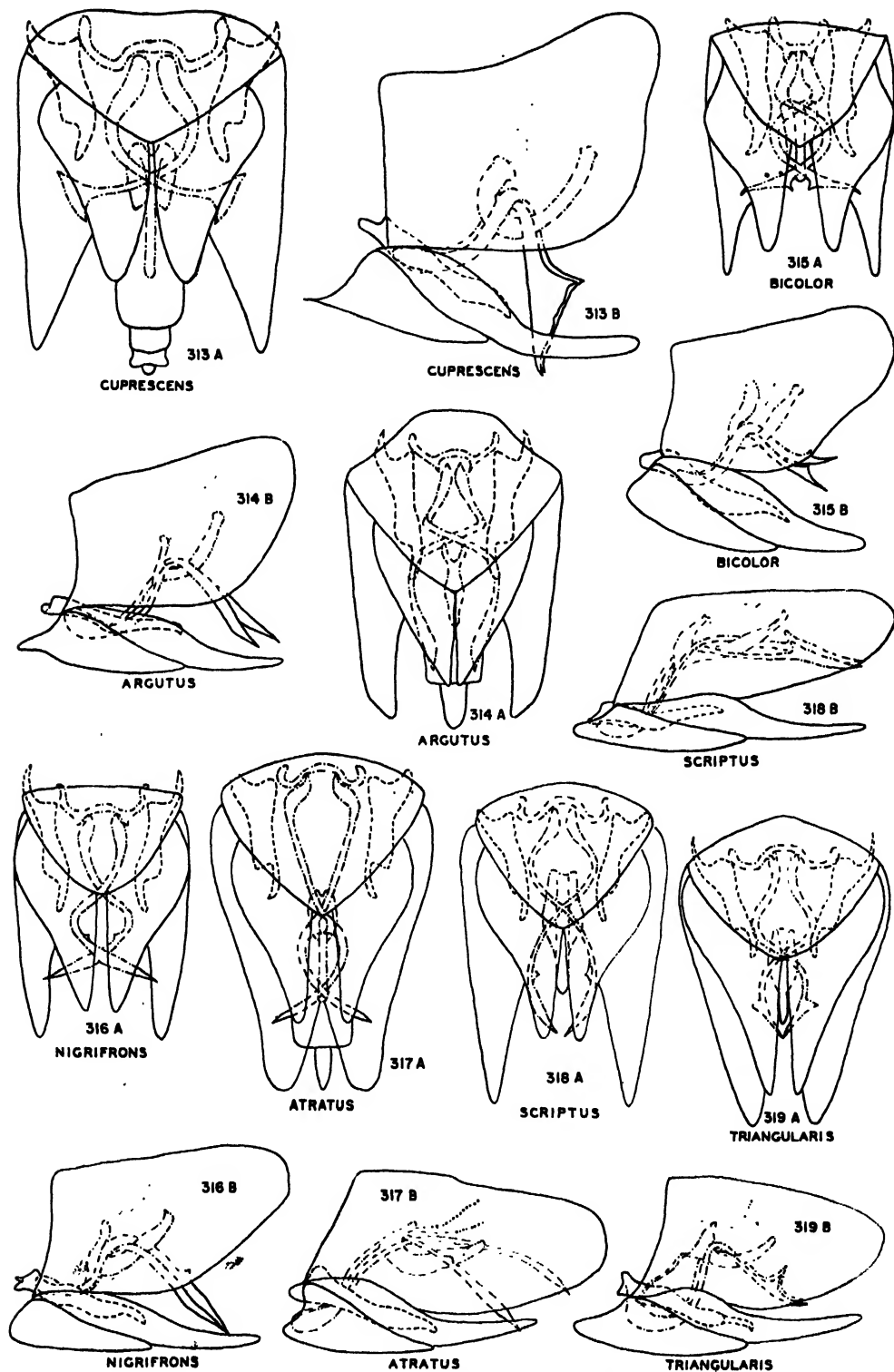


Figs. 300-306.—*Cloanthanus*, male genitalia. A, ventral aspect; B, lateral aspect.





Figs. 307-312.—*Cloanthanus*, male genitalia. A, ventral aspect; B, lateral aspect.



Figs. 313-319.—*Cloanthanus*, male genitalia. A, ventral aspect; B, lateral aspect.

- Face and vertex dull yellow; pronotum irrorate with brown, elytra pale, with brownish irrorations, apex of each elytron pale. . . . . **13. dorsalis**
20. Face yellowish. . . . . 21
21. Face brown or black. . . . . 23
21. Vertex long and pointed; blades of aedeagus processes, fig. 313, forming large triangular plates at apex. . . . . **15. cuprescens**
- Vertex pointed but shorter; apical portions of processes formed into elongate blades, as in figs. 321, 324. . . . . 22
22. Blade of each aedeagus process, fig. 321, widened between spine and apex. . . . . **3. hastus**
- Blade of each aedeagus process, fig. 324, tapering from spine to apex. . . . . **4. lanceus**
23. Spine large, forming a triangle with apex, fig. 319. . . . . **12. triangularis**
- Spine smaller, at least one-fourth the distance from apex and not forming a triangular apex, as in fig. 317. . . . . 24
24. Blades narrow, spine almost one-half the distance from apex to base, as in fig. 317. . . . . 25
- Blades shorter, spine nearer apex, not more than one-third the distance from apex to base, as in fig. 322. . . . . 27
25. Vertex dark, with few pale markings; face almost black. . . . . **9. atratus**
- Vertex with pale markings, appearing transversely banded; face brown. . . . . 26
26. Spine conspicuous, each style with narrow apical processes about one-fifth the length of entire style, fig. 320. . . . . **10. magdalenis**
- Spine minute, each style with narrow apical processes about one-third the length of entire style, fig. 325. . . . . **11. vaccinium**
27. Vertex appearing banded or marked with pale areas; face pale brown or with brownish irrorations. . . . . 28
- Vertex dark brown to black, with few pale markings; face dark brown to black. . . . . 29
28. Vertex white, with brown markings; aedeagus blade, fig. 322, narrow, spine large, bent inwardly, slightly broadened between spine and apex. . . . . **7. varius**
- Vertex more brownish, with a banded appearance; blade, fig. 323, broadest at spine, concavely tapered on dorsal margin to sharp-pointed apex. . . . . **8. andromus**
29. Face black; aedeagus blade, fig. 316, narrow, about uniform in width between delicate spine and apex. . . . . **5. nigrifrons**
- Face dark brown; blade, fig. 318, broadest at blunt spine, from which it is tapered to sharp-pointed apex. . . . . **6. scriptus**
30. Face and vertex pale, unmarked; pronotum and elytra darker. . . . . 31
- Vertex not pale, unmarked. . . . . 32
31. Face and vertex white; pronotum, scutellum, and elytra shiny black, elytra with few pale markings. . . . . **14. bicolor**
- Face and vertex dull yellow; pronotum irrorate with brown, scutellum pale, elytra with pale brownish irrorations, each apex pale. . . . . **13. dorsalis**
32. Fulvous brown, pronotum and anterior portion of scutellum black. . . . . **27. collaris**
- Color black or brown, but not brown with black pronotum. . . . . 33
33. Color black above, face bright yellow. . . . . **28. frontalis**
- Color not black above, not with bright yellow face. . . . . 34
34. Face some shade of yellow, often margined with brown. . . . . 35
- Face pale to dark brown or black. . . . . 43
35. Vertex long, sharp pointed, usually less than two-thirds as wide between eyes at base as median length. . . . . 36
- Vertex shorter, often sharply angled, usually more than two-thirds as wide between eyes as median length. . . . . 38
36. Color usually dark brown, tinged with red above and on face. . . . . **18. rubellus**
- Cuprescent or pale brownish, not tinged with red. . . . . 37
37. Pale brown. Known only from Florida. . . . . **29. slossoni**
- Copper colored. Known only from the northeastern United States. . . . . **15. cuprescens**
38. Gray, tinged with green above and on face. . . . . **16. angustatus**
- Not tinged with green. . . . . 39
39. Gray in color. . . . . 40
- Brown or fulvous in color. . . . . 41
40. Length 4.0 mm. . . . . **17. cinereus**
- Length 3.5 mm. . . . . **23. parvus**
41. Fulvous brown in color, with few pale or areolar spots except at apical cross-veins. . . . . **26. fulvus**
- Brown, with numerous pale and areolar spots throughout the elytra. . . . . 42
42. Vertex sharply pointed, heavily infuscated with brown. . . . . **2. argutus**
- Vertex usually blunter, pale brown, less heavily infuscated. . . . . **19. acutus, 20. filamentus, 25. tenuis**
43. Vertex twice as long as basal width between eyes, banded. . . . . **1. verecundus**
- Vertex shorter, not less than two-thirds as wide between eyes as median length. . . . . 44
44. Vertex appearing banded transversely. . . . . 45
- Vertex dark in color or without bands. . . . . 47
45. Vertex pale, with dark markings, pale areas large and conspicuous. . . . . **7. varius**
- Vertex darker, pale areas small. . . . . 46
46. Band on vertex formed by a V-shaped lighter spot on either side of vertex anterior to eyes. Known only from Florida. . . . . **8. andromus**
- Band usually less conspicuous, without V-shaped pale areas at sides of vertex. . . . . **10. magdalenis, 11. vaccinium**
47. Vertex with a sharp-pointed produced apex. . . . . 48
- Vertex less sharply produced. . . . . 49
48. Face pale brown. . . . . **21. cinnamomeus**
- Face dark brown. . . . . **22. abbreviatus**
49. Elytra shiny black, with few pale or areolar spots except on apical cross-veins. . . . . **5. nigrifrons**

- Elytra black or brown, mottled with pale spots or areoles.....50  
 50. Brown in color, with white longitudinal marks on vertex.....6. *scriptus*  
 Black in color, vertex marked with fewer light lines or spots.....9. *atratus*

1. *Cloanthanus verecundus* (Van Duzee)

*Platymetopius verecundus* Van Duzee (1910, p. 227).

Length 3.5–4.0 mm. Vertex rather sharply angled, more than twice as long at middle as basal width between eyes. Dark brown, tinged with orange, a broken pale band across vertex before anterior margins of eyes, and pale spots at base of vertex. Pronotum marked with five longitudinal lines. Scutellum orange. Elytra pale, with rather sparse reticulations, leaving many pale areas and areolar spots; veins brown. Face rather heavily irrorate with brown.

Female seventh sternite roundedly produced on posterior margin. Male plates almost as long as pygofer, gradually narrowed to blunt apices. Each style with short narrow finger-like apex produced on inner margin. Aedeagus, fig. 312, with a rather narrow dorsal portion that is narrowed on apical fourth and curved upward at base; ventral paired processes long and curved, with widened spearlike blades on apical third; spines absent.

This species is known only from Florida and the southeastern states.

2. *Cloanthanus argutus* DeLong

*Cloanthanus argutus* DeLong (1945, p. 24).

Length 4 mm. In form and general appearance resembling *hastus* but smaller and with distinctive male genitalia. Vertex rather sharply angled, a little more than half as wide as median length, one-fourth longer than pronotum. Dorsum dark brown, with pale markings. Vertex with conspicuous pale longitudinal vittae. Pronotum with several pale punctate spots. Elytra with brown veins and irrorate markings, leaving pale areas throughout and several round pale areolar spots. Face dull yellow below, brown above.

Female seventh sternite roundedly produced on posterior margin. Male plates shorter than pygofer, gradually sloping to bluntly pointed apices. Each style, fig. 314, narrowed somewhat at about three-fourths its length, apex rather broad, blunt, and

produced about one-fourth the length of style; dorsal portion of style medium in length, a little narrower at apex than base. Ventral paired processes of aedeagus with apical third widened to form a narrow blade that does not bear a spine on dorsal margin. Each pygofer broadly rounded at apex.

This species is recorded only from Georgia.

3. *Cloanthanus hastus* DeLong

*Cloanthanus hastus* DeLong (1945, p. 24).

Length 4.5 mm. Resembling *acutus* in form and general appearance but with a pale brown face. Vertex elongate, sharply angled, decidedly more than half as wide between eyes at base as median length. Dorsum rather dark brown, vertex with median apical vitta and slender elongate lines pale. Pronotum with five longitudinal vittae. Elytra rather heavily irrorate with brown, veins brown; many pale areas and areolar spots. Face pale brown.

Female seventh sternite roundedly produced on posterior margin. Male plates almost as long as pygofer, gradually narrowed to blunt apices. Each style, fig. 321, elongate, with abruptly narrowed finger-like process on inner margin of apex, the process almost one-third the length of the style. Aedeagus with the dorsal portion rather short and thickened and bluntly pointed at base; paired ventral processes each long and narrow to apical fifth, then widened to form spearlike blade that is pointed at apex, each blade bearing a small spine on the upper surface about one-fourth the distance from apex.

This species has been collected in Wisconsin, Ohio, Missouri, and Illinois.

**Illinois Records.**—Many males and females, taken May 18 to October 2, are from Alton, Cave in Rock, Centralia, Des Plaines, Dixon, Dolson, Eichorn, Fairfield, Galena, Geff, Herod, Keithsburg, Mahomet, Ozark, Pulaski, Vienna, Wauconda, and White Pines Forest State Park.

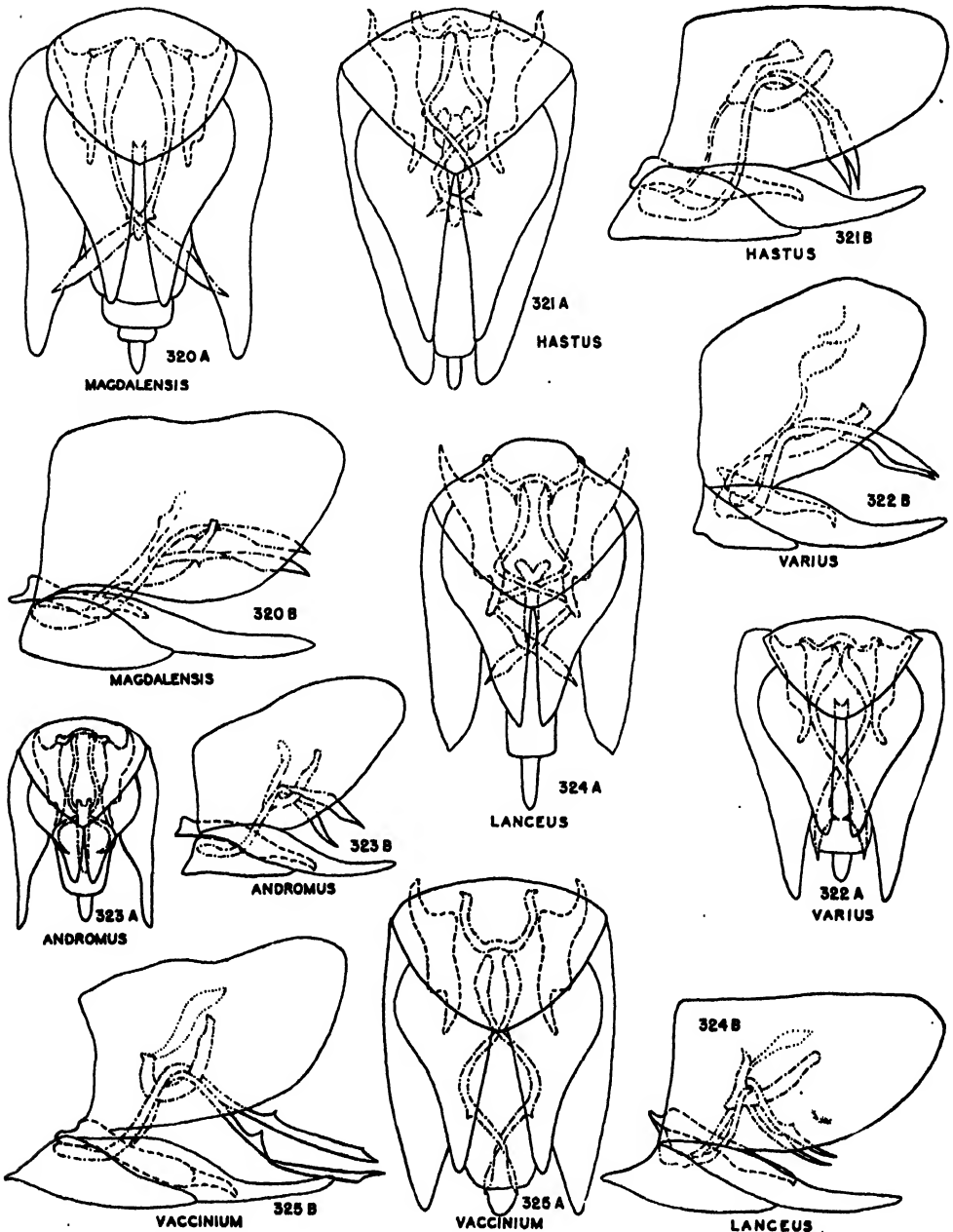
4. *Cloanthanus lanceus* DeLong

*Cloanthanus lanceus* DeLong (1945, p. 26).

Length 4 mm. Small, sharp headed, resembling *argutus* in general appearance but with distinctive genitalia. Vertex sharply pointed, almost half as wide between eyes at base as median length. Vertex pale

brownish, with longitudinal pale markings. Pronotum dark brown, with five pale longitudinal vittae. Scutellum paler than pronotum, apex pale brown. Elytra finely irrorate with dark brown, only a few pale spots visible and with few areolar spots. Face uniform dull yellow to pale brown, without infuscation above.

Female seventh sternite roundedly produced on posterior margin. Male style, fig. 324, notched on outer margin at about three-fourths its length, forming a finger-like process that is produced to form the apex of the style. Dorsal portion of the aedeagus medium in length, with a sharp bend at base; ventral paired processes curved



Figs. 320-325.—*Cloanthanus*, male genitalia. A, ventral aspect; B, lateral aspect.

through the bend in the dorsal portion, their apexes broadened to form bladelike structures that extend about one-fourth the length of process and bear a pointed heel on upper inner angle of blade.

This species has not been taken in Illinois. It was described from Georgia.

#### 5. *Cloanthanus nigrifrons* (DeLong)

*Platymetopius frontalis* var. *nigrifrons* DeLong (1923, p. 103).

Length 4 mm. Vertex short, bluntly angled, three-fourths as wide between eyes at base as median length. Black, vertex marked with white elongate spots. Pronotum with faint traces of white. Elytra black, shiny, with few white markings represented only by white areolar spots along commissural line of each clavus, and before and posterior to the apical crossveins. Face heavily irrorate with dark brown or black.

Female seventh sternite roundedly produced on posterior margin. Male plates almost as long as pygofers, gradually narrowed and rather blunt at apexes. Each style, fig. 316, rather narrow, apical fourth abruptly narrowed and produced on inner margin to form a long slender finger-like process. Dorsal portion of aedeagus rather long and thick, with apical fifth narrowed; ventral paired processes long and slender to apical fourth, which is broadened to form spearlike blades with sharp-pointed apexes and a rather prominent spine on upper margin almost one-third the distance from apex.

This black-faced species was described from Connecticut.

#### 6. *Cloanthanus scriptus* (Ball)

*Platymetopius scriptus* Ball (1909b, p. 165).

Length 4 mm. Vertex short, about three-fourths as wide between eyes at base as median length. Dark brown, vertex with a median white apical longitudinal vitta, a white one along margin next to each eye, a pair of discal white spots and small white spots at base. Pronotum marked with five longitudinal vittae. Scutellum with white spots on disc, basal angles tan. Elytra irrorate with brown, veins brown, pale areas throughout, and each elytron with round white areolar spots on apical portion; numerous brown costal veinlets. Face heavily irrorate with brown.

Female seventh sternite roundedly produced posteriorly. Male plates broad at bases and with narrow rounded apexes. Each style, fig. 318, elongate, apical fourth produced into a slender finger-like apex on inner margin. Aedeagus with dorsal portion long, narrowed just before apex, pointed at base, with an upturned spur; ventral paired pieces long and slender, with widened blades at apex that have barblike spines dorsally about one-third the distance from apex.

This species occurs in the middle western states and has been collected from several localities in Illinois.

**Illinois Records.**—Many males and females, collected May 18 to October 3, are from Anvil Rock, Apple River Canyon State Park, Elizabethtown, Marshall, Monticello, Ozark, Starved Rock State Park, Warren, and White Heath.

#### 7. *Cloanthanus varius* DeLong

*Cloanthanus varius* DeLong (1945, p. 26).

Length 4 mm. Resembling *magdalensis* in form but with vertex white, mottled with brown, and with distinct male aedeagus. Vertex short, blunt, more than three-fourths as wide between eyes as median length. Vertex with a marginal bar on either side at apex, and longitudinal brown vittae at apex and between eyes, giving it a transversely banded appearance. Pronotum dark brown. Scutellum tawny, with white spots on median portion. Elytra brown, heavily irrorate, with pale areolar spots. Face heavily irrorate with brown.

Female seventh sternite roundedly produced on posterior margin. Male pygofers decidedly longer than plates. Apical third of each style, fig. 322, narrowed to a slender curved finger-like process. Dorsal portion of aedeagus rather long, constricted just before apex; each of ventral paired processes broadened on apical fourth to form a blade; spine on upper margin about one-third the distance from apex and bent inwardly on dorsal margin.

This species is known only from Illinois.

**Illinois Records.**—DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♀. ELIZABETHTOWN: June 25, 1932, Ross, Dozier, & Park, 1 ♀. MARSHALL: Sept. 27, 1935, Frison & Ross, 1 ♀. MONTICELLO: June 11, 1934; Frison & DeLong, 1 ♂, 4 ♀. STARVED ROCK STATE PARK: July 14, 1932, Dozier

& Park, 1 ♀. WHITE PINES FOREST STATE PARK: July 12, 1934, DeLong & Ross, 1 ♀.

### 8. *Cloanthanus andromus* (Ball)

*Nasutoideus andromus* Ball (1931c, p. 221).

Length 4 mm. Vertex short, almost three-fourths as wide between eyes at base as median length. Vertex tawny, with short longitudinal vittae so arranged as to form a broken pale transverse band before anterior margins of eyes, and a narrower band at base. Pronotum brown, scutellum tawny. Elytra with veins brown, with sparse brown irrorations; costal veinlets brown, with numerous white areolar spots throughout the surfaces of elytra. Face pale brown.

Female seventh sternite roundedly produced on posterior margin. Male styles, fig. 323, each with a narrow apical finger-like process that is about one-fourth the length of style. Dorsal portion of aedeagus slender and elongate, curved at base, each of ventral paired processes with apical third broadened into blade that is sharp pointed; apex of each blade dorsally pointed.

This species is known only from Florida, but may occur in states farther north.

### 9. *Cloanthanus atratus* DeLong

*Cloanthanus atratus* DeLong (1945, p. 27).

Length 4 mm. In form and general appearance similar to *vaccinium* but with narrower aedeagus blades. Vertex about three-fourths as wide at base as median length. Color brown, vertex with few pale markings, short apical median vitta conspicuous. Elytra brown, with brown veins and scattered brown irrorations, leaving many pale areas and white areolar spots. Face heavily irrorate with brown. Male plates decidedly shorter than pygofer. Each style, fig. 317, with short narrow apical process that is about one-fourth the length of style. Dorsal portion of aedeagus broad at base, narrowed on apical fourth; each of ventral paired processes with apical third widened to form narrow blade, a small spine on dorsal margin more than one-third the distance from apex.

This species is known only from Illinois.

**Illinois Records.**—OREGON: Castle Rock, June 30, 1935, DeLong & Ross, 2 ♂. Volo: in bog, Aug. 24, 1935, DeLong & Ross, 1 ♂.

### 10. *Cloanthanus magdalensis* (Provancher)

*Platymetopius magdalensis* Provancher (1889, p. 275).

*Platymetopius obscurus* Osborn (1905a, p. 274).

Length 4.5 mm. In form and general appearance resembling *acutus* but with banded vertex and brown face. Vertex short and broad, more than two-thirds as wide between eyes as median length; brown, short white vittae arranged to form a broken transverse band before anterior margins of the eyes, and a pale band at base. Pronotum dark brown, scutellum pale brown. Elytra brownish subhyaline, with darker irrorations and with numerous pale areas and areolar spots. Face brownish irrorate. Male plates not reaching apexes of pygofer, plates gradually narrowed to bluntly pointed apexes. Each style, fig. 320, narrow, with short blunt narrowed finger-like apex that is about one-fifth the length of the style. Dorsal portion of aedeagus gradually narrowed from a rather thickened base to narrow apex; ventral paired processes each long and narrow to apical third, which is widened, bladelike, and with a prominent dorsal spine almost half the distance from apex.

This species is northeastern in distribution and occurs on species of *Vaccinium*.

### 11. *Cloanthanus vaccinium* DeLong

*Cloanthanus vaccinium* DeLong (1945, p. 27).

Length 4.5 mm. Short, broad headed, closely related to *magdalensis* but with some differences in the male genitalia. Vertex three-fourths as wide between eyes at base as median length; brown, appearing banded with conspicuous elongate white vittae at middle of apex and base. Elytra dull brown, with scattered darker brown irrorations; veins brown; white areolar spots along commissure of each clavus and in base of each apical and apex of each anteapical cell. Face heavily irrorate with brown. Each male style, fig. 325, abruptly narrowed at two-thirds its length, apical third finger-like and curving slightly outward. Dorsal portion of aedeagus broadly curved at base, narrowed on anterior margin at apex; ventral paired processes with apical third broadened into bladelike portions; a large conspicuous

spine on dorsal margin more than one-third the distance from apex.

This species is considered a synonym of *magdalensis* by Hepner (1946), but I believe that for the present it is advisable to consider the two species as distinct, based on the characteristics given in the key. More material from various parts of the range of the two species will ultimately solve this problem.

This species is known only from Illinois, and was taken on *Vaccinium* in bogs.

**Illinois Records.**—DIXON: Sept. 17, 1935, DeLong & Ross, 1 ♀. GRAND DETOUR: July 12, 1934, DeLong & Ross, 2 ♀. VOLO: July 27, 1934, DeLong & Ross, 1 ♀; in bog, Aug. 24, 1935, DeLong & Ross, 3 ♀.

### 12. *Cloanthanus triangularis* DeLong

*Cloanthanus triangularis* DeLong (1945, p. 27).

Length 4 mm. Resembling *magdalensis* but with a more pointed vertex and distinctive male genitalia. Vertex sharply angled, almost twice as long at middle as basal width between eyes; dark brown, with slender pale vittae. Elytra pale brown, irrorate with darker brown, leaving many pale areas and areolar spots; veins brown. Face heavily irrorate with brown. Male plates almost as long as pygofers. Each style, fig. 319, with apical third narrowed and produced as finger-like process. Dorsal portion of aedeagus rather short, narrowed to blunt apex; ventral paired processes enlarged near apexes to form large pointed spines on upper surface, spines about one-sixth the distance from apex.

This species has been collected only in Illinois.

**Illinois Records.**—EICHORN: Hicks Branch, June 13, 1934, DeLong & Ross, 1 ♀. NORRIS CITY: June 17, 1934, DeLong & Ross, 1 ♀. SHAWNEETOWN: June 14, 1934, Ross & DeLong, 11 ♂, 19 ♀; June 27, 1936, DeLong & Mohr, 1 ♀.

### 13. *Cloanthanus dorsalis* (Ball)

*Platymetopius frontalis* Var. *dorsalis* Ball (1909b, p. 164).

Length 4.5 mm. Vertex bluntly angled, three-fourths as wide between eyes at base as median length. Vertex, face, and venter pale yellow. Pronotum irrorate with brown.

Scutellum pale, with brown basal angles. Elytra pale, with brownish irrorations except on apical portions; apical half of each clavus pale, white areolar spots along commissural line and on corium and along apical crossveins; costal veinlets brown.

This species was described from Kansas. In Illinois three specimens have been taken that are quite similar to the type specimen and have been referred to this species. The male is unknown.

**Illinois Records.**—DOLSON: July 24, 1936, DeLong & Mohr, 1 ♀. EICHORN: Hicks Branch, June 13, 1934, DeLong & Ross, 1 ♀. ST. ANNE: July 20, 1934, DeLong & Ross, 1 ♀.

### 14. *Cloanthanus bicolor* (DeLong)

*Platymetopius bicolor* DeLong (1916, p. 38).

Length 4 mm. Vertex bluntly angled in the male, more than two-thirds as wide between eyes at base as median length. Vertex pale yellow, pronotum shiny black, scutellum black, with a white margin on apical angle. Elytra shiny black, without areoles except on anterior apical cells; apical border of each elytron white margined. Face and thorax below pale yellow, unmarked. Each male plate broad at base, narrow at apex, and rounded. Each style, fig. 315, with rather short finger-like process, which is narrowed and curved outwardly at apex. Dorsal process of aedeagus rather long, constricted just before rounded apex, and curved dorsally at base; ventral paired processes curved with half of a spear-head blade bearing a barblike spine at base about one-fourth the distance from apex.

This strikingly colored species is known only from one male collected in Tennessee.

### 15. *Cloanthanus cuprescens* (Osborn)

*Platymetopius cuprescens* Osborn (1905b, p. 517).

Length 5.5 mm. Vertex appearing sharp pointed, three-fifths as wide at base between eyes as median length. Brown, vertex with a short conspicuous pale vitta at apex. Pronotum with five pale longitudinal vittae. Elytra pale, irrorate with brown, having round white areoles and pale areas throughout the elytral surfaces. Face dull yellow, with a pale transverse band below apex, area darker between this pale band and margin.



of vertex. Male plates rather short, with blunt apexes. Dorsal process of aedeagus, fig. 313, with a rather long ventral portion, curved upward at base; a pair of ventral processes extending from base, curved around dorsal portion, then protruding to form in apical region broad triangular blades, each comprising about one-fourth of the entire ventral process.

This is the most common of the northern long-headed species of the genus.

**Illinois Records.**—Many males and females, taken May 27 to October 3, are from Alton, Antioch, Apple River Canyon State Park, Cave in Rock, Centralia, Dixon, Dolson, Dubois, Eichorn, Elizabethtown, Evergreen Park, Galena, Geff, Gibsonia, Grand Detour, Havana, High Knob, Jonesboro, Keithsburg, Mahomet, Monticello, Oregon, Palos Park, Pike, St. Anne, Vienna, Volo, White Pines Forest State Park, and Wolf Lake.

#### 16. *Cloanthanus angustatus* (Osborn)

*Platymetopius angustatus*. Osborn (1905b, p. 518).

Length 4 mm. Vertex in male bluntly pointed, about two-thirds as wide between eyes as median length, with longitudinal pale vittae. Pronotum irrorate with brown; scutellum tan. Elytra greenish-brown subhyaline, without areolar spots except before and just posterior to apical crossveins; posterior costal and apical veinlets broadly brown. Face tawny, male plates rather short, with narrow rounded apexes. Each style, fig. 303, with an abruptly narrowed, short, finger-like process on inner margin, about one-fifth the length of style. Dorsal process of aedeagus rather short and thick; paired ventral processes long and slender, curved about the dorsal process, and with very narrow scarcely widened blades.

This species has been recorded from New York and Missouri, and has been collected on pine in coniferous forests.

#### 17. *Cloanthanus cinereus* (Osborn & Ball)

*Platymetopius cinereus* Osborn & Ball (1897, p. 193).

Length 4 mm. Vertex rather short, two-thirds as wide as median length. Dorsum appearing greenish gray, with three con-

spicuous white longitudinal vittae on vertex. Pronotum with five conspicuous pale longitudinal vittae. Elytra light in color, with greenish-gray veins and sparse irrorations, veins on apical portion darker; large areas and areolar spots white. Face dull yellow. Each male style, fig. 301, with apical third narrowed and produced into a finger-like apex on inner margin. Dorsal portion of aedeagus rather broad at base, narrowed to about half its basal width at apex; ventral paired processes long, slender, and coiled around the dorsal portion of aedeagus.

This is the common prairie form of the genus and is found abundantly on the Illinois prairies. It has been recorded from the southeastern United States and from the Middle West.

**Illinois Records.**—Many males and females, taken from June 12 to October 2, are from Alsip, Amboy, Carman, Cave in Rock, Des Plaines, Elizabeth, Evergreen Park, Fairfield, Fulton, Grand Detour, Gulfport, Hanover, Kampsville, Momence, Oak Lawn, Oquawka, Oregon, Palos Park, Port Byron, Putnam, St. Anne, Spring Valley, Urbana, Watson, and Zion.

#### 18. *Cloanthanus rubellus* (Sanders & DeLong)

*Platymetopius rubellus* Sanders & DeLong (1919, p. 231).

Length 4.0–4.5 mm. Vertex strongly produced and sharply angled, less than two-thirds as wide between eyes at base as median length. Dorsum reddish brown, tinged with dark red. Vertex with a pale median apical vitta, and a pale vitta on either side of median vitta. Pronotum with five pale longitudinal vittae. Scutellum tan. Elytra brownish subhyaline, with darker irrorations, costal veinlets on apical half of each elytron brown margined; white areolar spots on apical portion and along commissural line of clavus. Face tawny, tinged with red. Male plates broad at base, rather long, and extending almost to tips of pygofers. Apical third of each style, fig. 300, narrow, finger-like, and produced almost straight on inner margin. Aedeagus with a long slender dorsal process and a pair of long slender processes that are usually coiled around the dorsal process.

The sharp-pointed vertex and reddish color will usually separate this species, which

has been found only on the East Coast of the United States, from closely related forms.

### 19. *Cloanthanus acutus* (Say)

*Jassus acutus* Say (1831, p. 306).

Length 4.5 mm. Vertex produced rather sharply, almost two-thirds as wide between eyes at base as median length. Dorsum brown, vertex with median pale vitta at apex, and conspicuous pale vitta on disc. Pronotum dark brown, scutellum tawny. Elytra pale, with scattered dark brown irrorations, leaving many pale spots and areolar spots. Face yellow, heavily infuscated with brown above the white line and at sides. Male pygofers one-fourth longer than plates. Each style, fig. 307, with apical third abruptly narrowed and produced as a slender finger-like process that curves outwardly. Dorsal portion of aedeagus with a long slender ventral process that is sinuate and tapered to apex, the latter slightly enlarged; ventral paired processes long and narrowed to apices. Each pygofer long, narrowed to a blunt produced apex.

A common yellow-faced species, *acutus* is transcontinental in distribution.

**Illinois Records.**—Many males and females, taken from May 7 to September 24, are from Adair, Alton, Amboy, Antioch, Apple River Canyon State Park, Aurora, Bushnell, Cave in Rock, Chester, Cypress, Danville, Des Plaines, Dixon, Dolson, Dubois, Elizabethtown, Elgin, Evergreen Park, Fern Cliff, Fox Lake, Galena, Geff, Golconda, Grand Detour, Grays Lake, Gulfport, Hanover, Hardin, Harrisburg, Havana, Justice, Kankakee, Karnak, Keithsburg, Lincoln, Mason City, Mound City, Mounds, Muncie, Niota, Normal, Oak Lawn, Oakwood, Ogden, Onarga, Oregon, Ozark, Pecatonica, Princeton, Pulaski, Putnam, Quincy, Round Lake, St. Anne, Shawneetown, Sparta, Starved Rock State Park, Urbana, Vandalia, Vienna, Virginia, Volo, Warren, Waukegan, Wolf Lake, and Zion.

### 20. *Cloanthanus filamentus* DeLong

*Cloanthanus filamentus* DeLong (1945, p. 22).

Length 5 mm. Resembling *acutus* in form and general appearance, but paler in color and with a shorter dorsal aedeagus in male

and blunter pygofers. Vertex two-thirds as wide between eyes at base as median length. Dorsum light brown, with three pale vittae on anterior portion of body. Pronotum with the usual pale vittae. Apical half of scutellum pale. Elytra rather sparsely irrorate with pale brown so that many areolar spots and pale areas are seen throughout the surface. Face yellow, with brown margin above. Each male style, fig. 308, narrow, gradually narrowed just beyond middle to narrow curved apical process that is more than one-third the length of the style. Dorsal portion of aedeagus with an elongated narrow process that is shorter than in *acutus*. Ventral paired processes long, slender, extending almost to apex of pygofers. Pygofers more blunt at apices than in *acutus*.

This species was described from Pennsylvania and has been taken at several localities in Illinois.

**Illinois Records.**—AMBOY: May 21, 1917, 1 ♂; Aug. 8, 1934, DeLong & Ross, 1 ♂. DES PLAINES: Sept. 18, 1935, DeLong & Ross, 3 ♂. JUSTICE: July 23, 1937, Mohr & Burks, 1 ♀. KANKAKEE: Aug. 8, 1935, Ross & DeLong, 1 ♂. MOUNDS: May 23, 1932, H. L. Dozier, 1 ♂. OAK LAWN: sand prairie, July 27, 1934, DeLong & Ross, 1 ♂. OAKWOOD: Aug. 17, 1934, DeLong & Ross, 1 ♂. VOLO: July 16, 1935, DeLong & Ross, 1 ♂.

### 21. *Cloanthanus cinnamomeus* (Osborn)

*Platymetopius magdalenis* var. *cinnamomeus* Osborn (1915, p. 114).

Length 4 mm. Resembling *acutus* in form and general appearance but with face pale brown and with distinctive genitalia. Vertex bluntly angled, about two-thirds as wide between eyes at base as median length. Vertex, pronotum and scutellum cinnamon brown, with pale elongate lines and vittae. Elytra pale, with brown veins and rather heavy brown irrorations having numerous pale spots and areoles; costal veinlets broadly brown. Face irrorate with pale brown. Each male style, fig. 310, narrowed just beyond middle, apical half forming a long rather thick finger-like process. Dorsal portion of aedeagus rather short, apex slightly enlarged; ventral paired processes long, slender, apices curved ventrally and anteriorly.

This species has been taken only in

Canada, Maine, and other northern states bordering Canada. It is unique in genital characters.

## 22. *Cloanthanus abbreviatus* (DeLong)

*Platymetopius abbreviatus* DeLong (1916, p. 39).

Length 4 mm. Resembling *acutus* in form and appearance but with a brown face. Vertex bluntly angled, a little more than half as wide at base as median length. Vertex brown, with whitish longitudinal vittae. Pronotum dark brown, with five pale longitudinal vittae; scutellum paler. Elytra pale, with brown veins and rather sparse reticulations, leaving many white areas and areolar spots; numerous costal veins brown. Face marked with pale brownish irrorations. Male plates about two-thirds as long as pygofers. Each style, fig. 311, abruptly narrowed at less than two-thirds its length and produced as a long slender process that is curved or hooked at apex. Dorsal portion of aedeagus broadly curved at base, rather thick throughout its length, and sinuate, the apex pointed on inner margin; ventral paired processes long and narrow. Pygofers long, tapered to bluntly pointed apices.

This species was originally described from two female specimens from Tennessee. Additional specimens, including males, have since been taken in Wisconsin and Illinois.

Illinois Records.—AMBOY: Aug. 8, 1934, DeLong & Ross, 1 ♂. CAVE IN ROCK: Oct. 2, 1934, Ross, 2 ♂. EICHORN: Hicks Branch, June 13, 1934, DeLong & Ross, 2 ♀. OREGON: June 21, 1917, 1 ♂; Aug. 23, 1935, DeLong & Ross, 4 ♂, 4 ♀. ST. ANNE: Aug. 21, 1934, DeLong & Ross, 1 ♂; Aug. 4, 1936, Frison & Burks, 1 ♂. WOLF LAKE: July 30, 1934, DeLong & Mohr, 4 ♂.

## 23. *Cloanthanus parvus* (Lathrop)

*Platymetopius parvus* Lathrop (1917, p. 122). *Platymoideus ovideus* Ball (1931c, p. 227).

Length 3.5 mm. Small, resembling *cinereus* in color and general appearance. Vertex blunt at apex, slightly more than half as wide between eyes at base as median length. Dorsum pale, marked with brown. Vertex completely lined with pale longitudinal vittae. Pronotum with brown reticulations and five conspicuous pale longitudinal vittae. Scutellum tawny. Elytra pale, marked with brown veins and sparse reticu-

lations; apex of each smoky, costal veinlets brown, numerous white spots and reticulations throughout. Face bright yellow, darker above. Each male style, fig. 305, abruptly narrowed at about two-thirds its length, apical third narrow and produced into a long finger-like process. Dorsal portion of aedeagus short and rather thick, broadly rounded at base; ventral paired processes long and slender, reaching almost to apices of pygofers.

This relatively minute species has been collected only in the southeastern United States.

## 24. *Cloanthanus parvus* var. *niger* DeLong

*Cloanthanus parvus* var. *niger* DeLong (1945, p. 27).

Length 3.5 mm. Resembling *parvus* in size and general appearance, but darker in color and with shorter and blunter vertex. Dark brown, vertex heavily irrorate with a few pale longitudinal markings. Pronotum with five pale vittae. Scutellum paler. Elytra irrorate with brown, leaving many pale spots and white areoles. Face pale brownish. Male genitalia similar to those of *parvus*. The dorsal portion of the aedeagus short, rather thick, broadly rounded at base; the ventral paired processes slender throughout.

Known only from Alabama, this variety appears to be distinct from typical *parvus* in general appearance.

## 25. *Cloanthanus tenuis* DeLong

*Cloanthanus tenuis* DeLong (1945, p. 24).

Length 4.5 mm. Resembling *acutus* in form and general appearance but with a shorter basally rounded dorsal process of the aedeagus. Vertex a little more than half as wide between eyes at base as median length. Pale brown, vertex with pale longitudinal vittae, especially on apical portion. Pronotum darker on disc, scutellum with apical portion orange yellow. Elytra marked with pale brownish irrorations, leaving many pale areas and areolar spots. Face yellow, with a brown border above.

Each male style, fig. 309, with short finger-like process at apex, about one-fifth the length of the style. Dorsal portion of aedeagus medium in length, narrow, and with base sharply curved; ventral paired

processes of aedeagus long and slender, reaching to apexes of pygofer.

Described from South Dakota and Utah, this species has not been collected in Illinois.

## 26. *Cloanthanus fulvus* (Osborn)

*Platymetopius fulvus* Osborn (1905b, p. 519).

Length 4.5 mm. Vertex bluntly angled, in male less than two-thirds as wide between eyes at base as median length. Dorsum brownish fulvus, vertex paler, with three faint longitudinal vittae. Scutellum pale, lateral angles brown. Elytra with pale areoles before and caudad to apical cross-veins, apical veinlets broadly embrowned. Face dull yellowish, without darker margins. Male styles, fig. 302, each long and narrow, with finger-like process on inner margin, which is blunt at apex and projects about one-fourth the length of the style. Dorsal portion of aedeagus long and slender, bowed upward at base; ventral paired processes long and slender, with a slender branch arising on inner margin about two-fifths the distance from each apex.

This is a common species in some north-eastern states. It has been recorded from New York, Pennsylvania, and Ohio, but has not been taken in Illinois. It is similar to *collaris* in genital characters.

## 27. *Cloanthanus collaris* (Sanders & DeLong)

*Platymetopius collaris* Sanders & DeLong (1919, p. 232).

Length 4.5 mm. Closely related to *fulvus*; vertex more bluntly angled and pronotum dark brown or black. Vertex in male more than two-thirds as wide between eyes at base as median length. Median pale vitta at apex of vertex conspicuous. Pronotum dark brown to black, the lateral margins often paler. Scutellum with anterior half black, posterior portion brown. Elytra dark brown, costal veins and veins on apical portions brown, areoles occurring only just anterior and posterior to the apical cross-veins. Face pale brown. The male genitalia are similar to those of *fulvus*. Aedeagus with the long slender paired ventral processes each branched on inner margin about two-fifths the distance from apex.

This species, which is characteristically marked, is known at present only from the mountains of Pennsylvania.

## 28. *Cloanthanus frontalis* (Van Duzee)

*Platymetopius frontalis* Van Duzee (1890b, p. 112).

Length 4.0–4.5 mm. Vertex short, bluntly angled, three-fourths as wide between eyes at base as median length. Color black, vertex with conspicuous white vittae on apical portion. Pronotum usually with traces at least of pale longitudinal vittae. Scutellum black. Elytra heavily irrorate with dark brown or black, with numerous small white spots and white areoles; apex of each broadly margined with black. Face bright yellow, infuscated at sides and darker above. Male plates almost as long as pygofer. Each style, fig. 306, abruptly narrowed at about two-thirds its length, apical third slender and produced into finger-like process. Dorsal portion of aedeagus rather long, broadly curved at base; ventral paired processes long and slender, reaching almost to tips of pygofer.

This is a common species throughout Illinois, occurring on leguminous and other herbaceous plants and crops. It is recorded from the eastern United States, the Middle West, and California.

**Illinois Records.**—Many males and females, taken May 17 to October 3, are from Adair, Anvil Rock, Arlington Heights, Atlas, Barry, Beach, Bushnell, Cairo, Cave in Rock, Cobden, Cornfield, Cypress, Danville, Decatur, Des Plaines, Dolson, Dubois, Eichorn, Elizabeth, Evergreen Park, Fairfield, Fern Cliff, Fulton, Geff, Gibsonia, Glencoe, Grafton, Grand Detour, Grays Lake, Hamburg, Hanover, Hardin, Harrisburg, Havana, Herod, High Knob, Homer, Justice, Kampsville, Karnak, Kinmundy, Kirkwood, Lawrenceville, Luther, Makanda, Marshall, Momence, Mount Carmel, Muncie, New Holland, Normal, Oak Lawn, Oquawka, Oregon, Ozark, Princeton, Pulaski, Quincy, Seymour, Shawneetown, Sparta, Starved Rock State Park, Summit, Ullin, Urbana, Ursa, Vandalia, Vienna, Virginia, Ware, Watson, Waukegan, Wolf Lake, and Zion.

## 29. *Cloanthanus slossoni* (Van Duzee)

*Platymetopius slossoni* Van Duzee (1910, p. 222).

Length 4 mm. Resembling *acutus* in color but with a long sharp pointed vertex. Decidedly less than half as wide between eyes

at base as median length; pale brownish, with pale longitudinal vittae. Pronotum dark brown, with five pale longitudinal vittae. Elytra pale, with brownish irrorations and brown veins, leaving many pale areas and pale areolar spots. Face yellow, infuscated with brown at margins and above. Male plates almost as long as pygofer, gradually narrowed to blunt tips. Apical one-third of each style, fig. 304, narrowed to form a thick finger-like process. Dorsal portion of aedeagus slightly tapered to a blunt apex; ventral paired processes narrow, scarcely widened at apices, tips sharp pointed.

This long-headed species is known only from Florida.

### 50. *ACURHINUS* Osborn

*Acurhinus* Osborn (1920, p. 158).

Fig. 205. Head strongly produced, the vertex with sides nearly straight, apex acute, slightly concave above; frons reaching close to eyes, antennal pits touching eyes, and ocelli very close to eye borders; a distinct furrow beneath the front margin between vertex and front; front strongly convex. Costa with strongly reflexed veinlets next to the outer anteapical cell, which is much reduced.

Only one species from the United States is placed in this genus.

#### 1. *Acurhinus pyrops* (Crumb)

*Deltocephalus pyrops* Crumb (1915, p. 191).

Length 3.5–4.0 mm. Brownish yellow, with a very long pointed vertex. Eyes and ocelli bright red. Vertex with a black spot on either side of apex, a posterior spot and two pairs of transverse marks on disc fuscous. Face yellow, margined above with brown. Elytra pale, nervures margined with fuscous, costal areas yellowish.

Female seventh sternite, fig. 290C, with posterior margin gradually sloping to the middle third, which is almost squarely excavated one-fourth the distance to base and bears a short broad black tooth. Male plates, fig. 290, short and broad, lateral margins convexly rounded to broad blunt slightly divergent apices.

This species occurs in the eastern United States, and is abundant in Illinois.

**Illinois Records.**—Many males and fe-

males, taken June 12 to October 3, are from Albion, Alton, Anvil Rock, Cave in Rock, Dixon Springs, Dolson, Dongola, Eichorn, Elizabethtown, Geff, Herod, Metropolis, Parker, St. Anne, Vienna, and Watson.

### 51. *FLEXAMIA* DeLong

*Flexamia* DeLong (1926a, p. 22).

Figs. 224, 326. Vertex strongly produced, pointed, disc flattened or slightly depressed, acutely and sharply angled with the front.

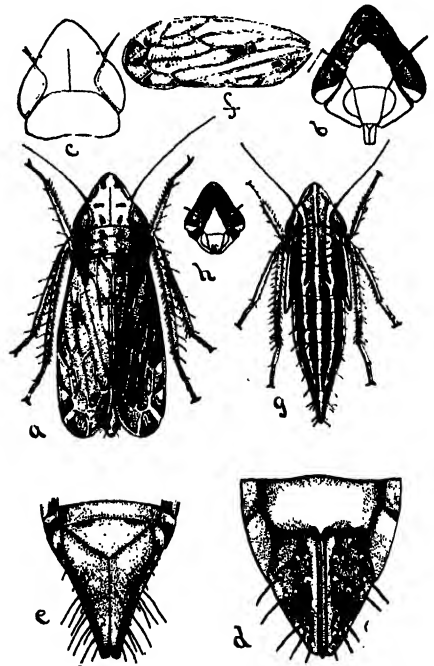


Fig. 326.—*Flexamia reflexa*: a, adult; b, face; c, head and pronotum; d, female genitalia; e, male genitalia; f, elytron; g, nymph; h, face of nymph. (From Osborn.)

Face elongated, elytra with apical costal veinlets reflexed or very short and right angled. Inner claval veins often partially coalescing, with or without appendix.

The species of this genus are usually conspicuously marked by the broad white coloration on the apical costal reflexed veinlets. In habit they are all grass feeding and live in meadows, pastures, and prairies. Twenty-seven species have been recorded for the United States, chiefly middle western regions. Eleven of these species have been taken in Illinois. Several others may occur in this state.

## KEY TO SPECIES

1. Vertex, pronotum, and scutellum, fig. 327A, marked by heavy coalescing black bars and spots giving the appearance of a black wedge-shaped marking extending onto clavus of each elytron..... 1. **rubranura**  
Vertex, pronotum, and scutellum without heavy black markings in the form of coalescing bars and spots..... 2
2. Color bright yellow or yellowish olive, with a large round black spot on center of each elytron; vertex, fig. 327B, without transverse marking.... 2. **areolata**  
Color white, yellowish gray, or brownish yellow, spots when present on elytra smaller; vertex with transverse markings or longitudinal stripes, or both..... 3
3. White or lemon yellow, marked with conspicuous brown longitudinal stripes on base of vertex, on pronotum, and on scutellum..... 4  
Some shade of brownish or grayish yellow, not white, and without definite longitudinal stripes on base of vertex, on pronotum, and on scutellum..... 5
4. Length not over 4.5 mm. Head and pronotum, fig. 327C, white with brown stripes. Elytra not appearing longitudinally striped..... 3. **albida**  
Length more than 5 mm. Head and pronotum, fig. 327D, lemon yellow, with brown stripes. Elytra appearing longitudinally striped..... 4. **grammica**
5. Vertex broad, as wide between eyes as median length or slightly longer than width at base..... 6  
Vertex more narrowed, decidedly longer at middle than basal width between eyes..... 7
6. Female seventh sternite, fig. 328E, with central obtuse lobe incised at middle and bearing a conspicuous black tooth at middle on each side. Male plates, fig. 337, truncate and divergent at tips; inner margins of pygofers enclosing long black styles that exceed plates.... 5. **stylata**  
Female seventh sternite, fig. 328F, without conspicuous black teeth on margins of central lobe. Male plates, fig. 338, convexly rounded to bluntly pointed apices; styles not visible.... 6. **inflata**
7. Female..... 15  
Male..... 8
8. Male plates, fig. 339, scarcely narrowed apically, broadly rounded. 7. **pectinata**  
Male plates decidedly narrowed apically, apices not broadly rounded, as in fig. 342..... 9
9. Male plates, fig. 342, strongly divergent on apical third, apices pointed..... 8. **sandersi**  
Male plates with apices appressed or proximal, not divergent on apical third, as in fig. 340..... 10
10. Male plates rather long, concavely rounded or straight on outer margins, not greatly exceeded by pygofers, as in fig. 340..... 11

Male plates shorter, convexly rounded to blunt apices, exceeded by pygofers by at least half their length, as in fig. 332..... 13

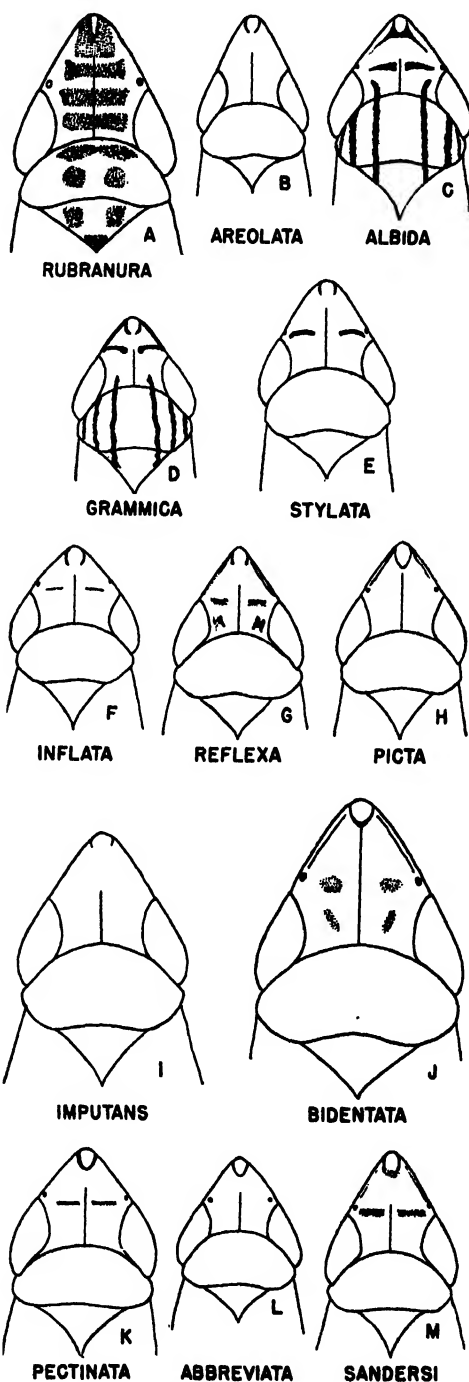


Fig. 327.—*Flexamia*, A–M, heads and pronota.

11. Male plates, fig. 340, with produced finger-like processes on outer margins at apexes. Aedeagus with two terminal serrate processes.....9. **bidentata**  
Male plates without finger-like processes on outer margins at apexes. Aedeagus with three terminal processes, as in fig. 341.....12
12. Aedeagus, fig. 341, with a dorsal terminal process; a large ventral process with two large spines at base; small processes at apex of aedeagus not serrate....  
.....10. **reflexa**  
Aedeagus, fig. 329, without a dorsal terminal process; large ventral process without spines; small lateral apical processes serrate.....11. **prairiana**
13. Plates very short, pygofers exceeding plates by their length. Aedeagus, fig. 331, with two terminal lateral processes.....12. **picta**  
Plates long, pygofers exceeding plates by about one-half their length, as in fig. 332.....14
14. Aedeagus, fig. 332, with terminal processes. Color creamy yellow, face black.....  
.....13. **imputans**  
Aedeagus, fig. 330, without terminal processes. Color pale cinereus, face infuscated.....14. **abbreviata**
15. Female seventh sternite, fig. 328G, notched, forming four median teeth on posterior margin.....7. **pectinata**  
Female seventh sternite with not more than two distinct teeth, as in fig. 328K.....16
16. Median notch on female seventh sternite, fig. 328K, forming two broad teeth, each of which is either truncate or concave at apex.....  
.....14. **abbreviata**  
Teeth of median portion of seventh sternite, if present, sharp pointed, sometimes wanting.....17
17. Posterior margin of seventh sternite truncate or sloping from lateral angles to median produced portion, figs. 328I, 328J.....10. **reflexa**, 8. **sandersi**

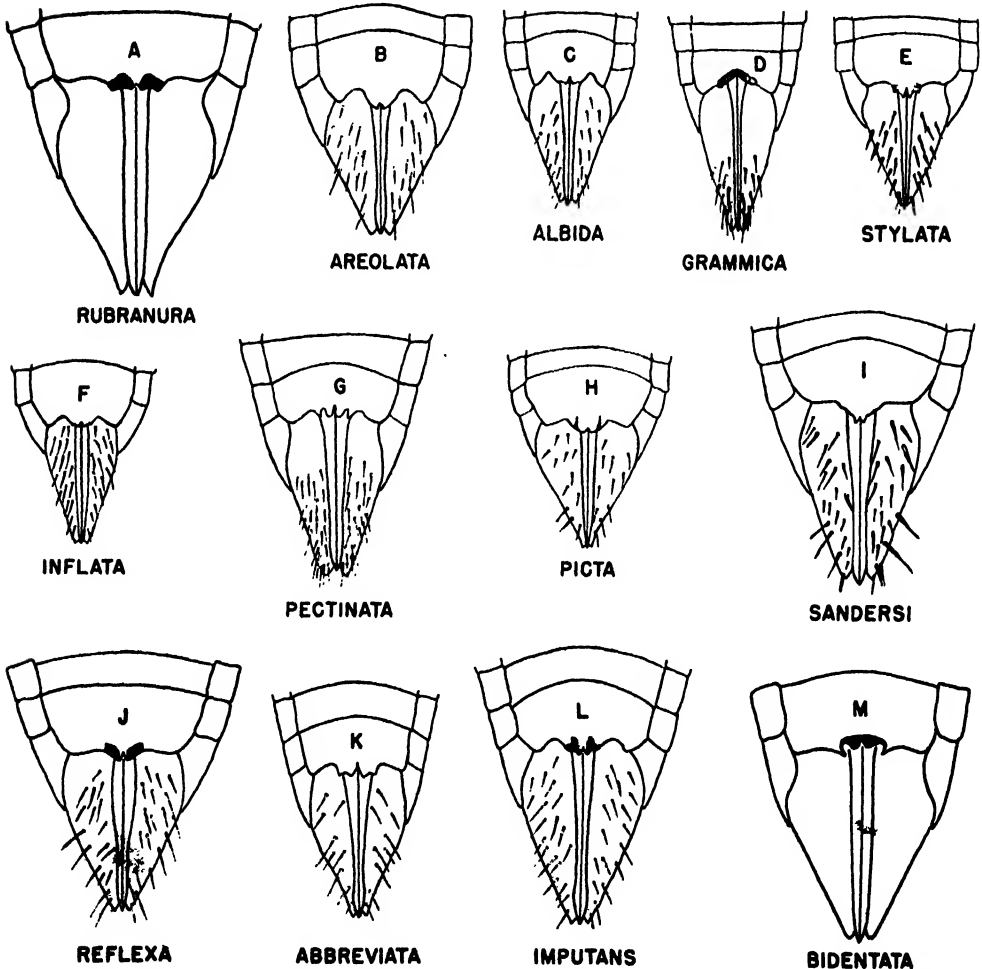
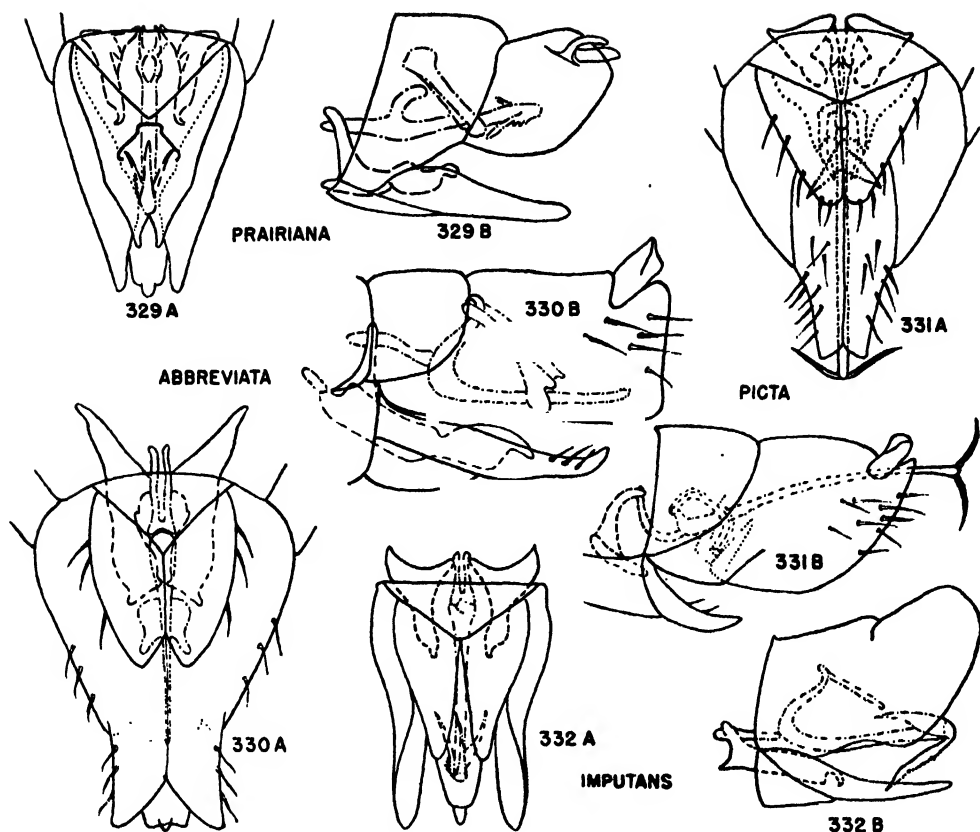


Fig. 328.—*Flexamia*, A–M, female genitalia.



Figs. 329–332.—*Flexamia*, male genitalia. *A*, ventral aspect; *B*, lateral aspect.

- Posterior margin of seventh sternite broadly notched or concavely emarginate between lateral angles and median notch, as in fig. 328*B*.....18
18. Creamy yellow in color, face black.....13. *imputans*
- Pale cinereus in color, face infuscated and with some pale markings.....19
19. Usually heavily marked with black or dark fuscous, nervures of veins heavily infuscated.....12. *picta*
- Usually not heavily marked with black, nervures of elytra only moderately infuscated.....11. *prairiana*, 9. *bidentata*

# 1. *Flexamia rubranura* DeLong

*Flexamia rubranura* DeLong (1935a, p. 154).

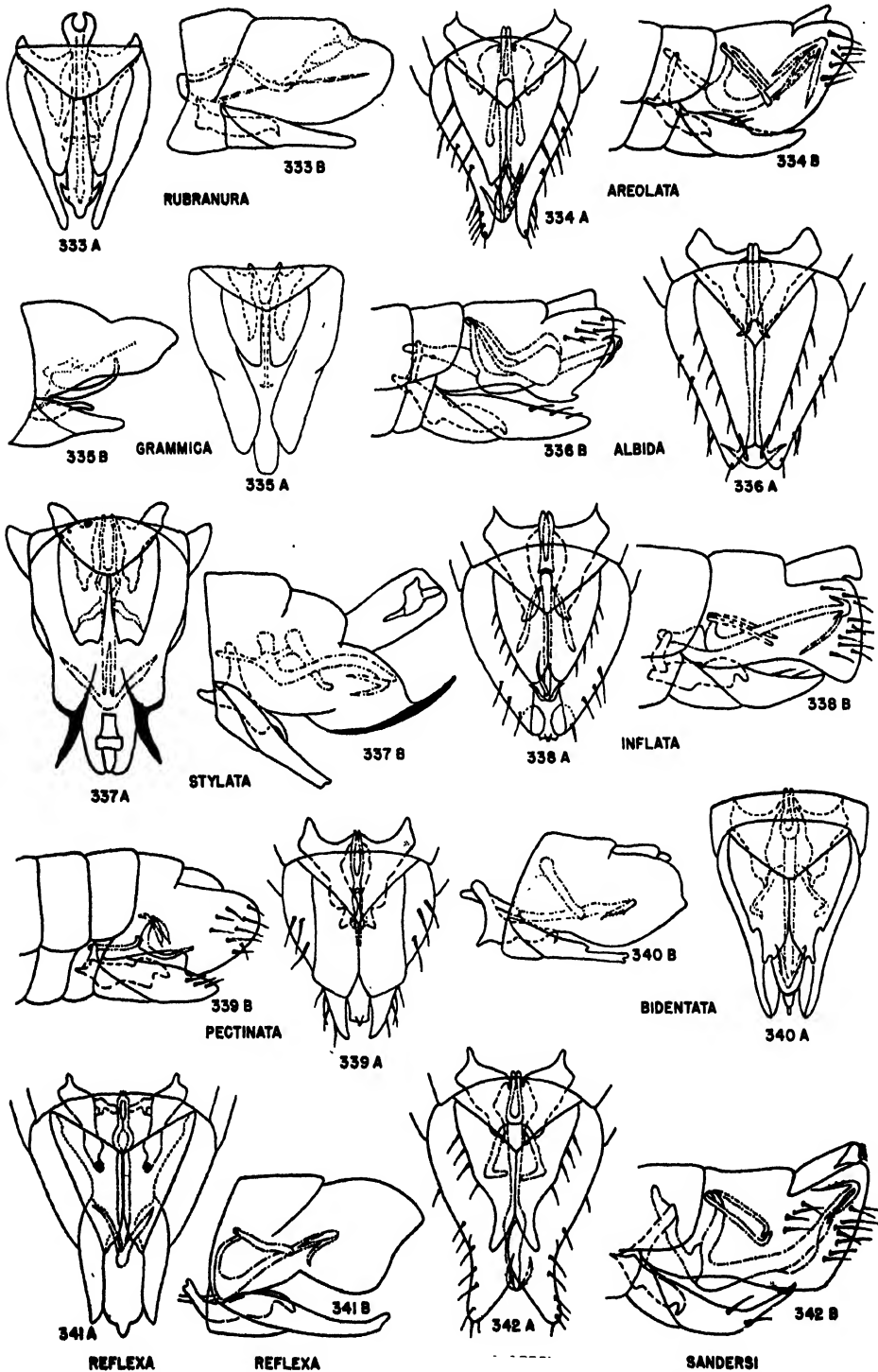
Length 3.0–3.2 mm. Yellowish, with heavy markings. Vertex, fig. 327*A*, one-third longer than width between eyes. Elytra short, covering only the first three or four abdominal segments. A broad black wedge-shaped mark composed largely of wide black transverse bars extending from apex of vertex to claval area of the elytra; a pair of black spots on pronotum behind

the eyes and two pairs at about the middle of the wings. Abdomen with four longitudinal black lines. Face and venter dark brown to black. Tips of male pygofer bright red.

Female seventh sternite, fig. 328*A*, almost truncate, middle third slightly produced and notched, forming a broad truncated or concavely rounded tooth on either side and with a black spot on either side of middle. Male plates gradually tapered to broadly rounded apices that are about one-half as wide as basal width, exceeded in length by the bright red pygofer. Aedeagus, fig. 333, with body short; a process arises on either side and extends into genital chamber; a ventral process arises from base, curves ventrally and caudally and lies between the terminals of the two dorsal branches; ventral process consists of two long slender parallel and proximal processes.

This species was described from northern Illinois, where it occurs on the moist prairies in at least two localities.





Figs. 333-342.—*Flexamia*, male genitalia; both internal and external structures shown. A, ventral aspect; B, lateral aspect.

**Illinois Records.**—EVERGREEN PARK: Aug. 23, 1934, DeLong & Ross, 24 ♂, 42 ♀; July 1, 1935, DeLong & Ross, 5 ♂. SUMMIT: July 17, 1935, DeLong & Ross, 12 ♂, 12 ♀.

## 2. *Flexamia areolata* (Ball)

*Deltocephalus areolatus* Ball (1899b, p. 188).

Length 3.5–4.0 mm. Pale olive to bright yellow. Vertex, fig. 327B, more than one-half longer at middle than width between the eyes, with crescent marks at apex enclosing a white spot. Elytra each with a large black or fuscous blotch between sectors and behind the first cross nervure, the outer apical margin and anterior borders of the broad white reflexed veins fuscous. Face and venter black.

Female seventh sternite, fig. 328B, with the posterior margin angularly excavated one-fourth the distance to base on either side of a rounded medially notched tooth, which is one-fourth the width of segment and equals the lateral angles in length. Male plates gradually narrowed to bluntly pointed divergent apices. Aedeagus, fig. 334, with three terminal processes, the two shorter processes smooth; longer process heavily clothed with coarse pubescence.

This species is a prairie type occurring on a *Panicum* or a closely related genus, which grows on sand prairies and in similar habitats. It is very common throughout the prairies of Illinois and is recorded from the eastern United States and west to Arizona.

**Illinois Records.**—Males and females, taken June 14 to October 4, are from Apple River Canyon State Park, Barry, Carman, Cave in Rock, Dixon Springs, Eichorn, Fulton, Hanover, Havana, Marshall, Oquawka, Oregon, Port Byron, St. Anne, Thomson, Urbana, Vienna, and Watson.

## 3. *Flexamia albida* (Osborn & Ball)

*Deltocephalus albidus* Osborn & Ball (1897, p. 201).

Length 4.25 mm. Milky white, with brown marking. Vertex, fig. 327C, a little longer at middle than basal width between eyes, a black or dark brown triangular margin enclosing pale spot at apex, a transverse band between eyes, and four or six longitudinal lines across pronotum, the inner pair arising on the base of vertex and extending across scutellum on to elytra. Elytra

with claval and apical margins, anterior borders of reflected veins, and spots on each clavus and disc, brown or black.

Female seventh sternite, fig. 328C, divided into three lobes by two angular excavations extending one-third the distance to base; central lobe almost as broad as the combined width of the other two, incised at middle, and with a slight blunt tooth on either side. Male plates gradually tapering to blunt convexly rounded apices. Aedeagus, fig. 336, with a pair of terminal processes, each branched near base and giving rise to two short ventrally or laterally directed spines.

A distinctly marked species, *albida* occurs only in prairie habitats in a few middle western states.

## 4. *Flexamia grammica* (Ball)

*Deltocephalus grammicus* Ball (1900b, p. 204).

Length 5.25 mm. Lemon yellow, marked with brown stripes. Vertex, fig. 327D, about one-fifth longer at middle than width between eyes; white, washed with yellow; fuscous crescent marks at apex, marginal line and a transverse medially interrupted band between ocelli also fuscous; a pair of dark brown longitudinal stripes arising on basal third of vertex and continuing across pronotum and scutellum. Pronotum with two additional lines behind each eye; four central lines continuing on to elytra, the two on each side converging and uniting before tip of clavus, where they terminate. Three other bands paler in color on each elytron interrupted by pale yellow veins. Face yellow, a black line just beneath margin of vertex.

Female seventh sternite, fig. 328D, with posterior margin angularly excavated one-third the distance to the base; margin of excavation near center slightly toothed and marked with black. Male plates short and broad, with broadly rounded apices. Aedeagus, fig. 335, slender with two very short laterally directed terminal processes; a short dorsal process arises at base and has a pair of longer processes at its apex.

An abundant species on the sand prairies in Illinois, *grammica* is one of the most striking in color of this genus. It has been recorded previously from Colorado and Nebraska.

**Illinois Records.**—FULTON: Aug. 22, 1935, DeLong & Ross, 5 ♂. THOMSON:

June 30, 1935, DeLong & Ross, 113 ♂, 101 ♀; Aug. 16, 1937, Ross & Burks, 1 ♂, 4 ♀.

### 5. *Flexamia stylata* (Ball)

*Deltocephalus stylatus* Ball (1899b, p. 190).

Length 4.5 mm. Pale cinereous. Vertex, fig. 327E, very slightly longer than its basal width, yellowish, with apical dark spots and with a transverse broken line between ocelli. Elytra marked as in *flexulosa* (Ball) (1899b, p. 199), nervures pale, margined with fuscous; outer region of each clavus with a dark spot on either side of first cross nervure of the disc.

Female seventh sternite, fig. 328E, with posterior margin produced on the middle third into an obtusely triangular tooth, bifid at apex and bearing a small lateral tooth on either side. Male plates, fig. 337, roundly divergent at the apexes, which are half as wide as at the bases; apexes truncate or slightly and roundly emarginate. Styles long, narrow, black, exceeding pygofer.

This prairie species has been collected only rarely, and very little is known of its food habits. It has been recorded from Iowa and Nebraska.

### 6. *Flexamia inflata* (Osborn & Ball)

*Deltocephalus inflatus* Osborn & Ball (1897, p. 202).

Length 3.0–4.5 mm. Yellowish to brownish. Vertex, fig. 327F, almost as wide between eyes as length at middle, similarly marked as in *stylata*. Pronotum and scutellum with longitudinal markings. Elytra with veins on each clavus, on the disc, and on apical portion of each elytron bordered with fuscous.

Female seventh sternite, fig. 328F, with posterior margin roundly notched on either side of a central broad produced lobe, which is notched at center and bears a black spot and slight tooth on the sloping sides. Male plates, fig. 338, gradually and convexly rounded to appressed roundly pointed apexes, sometimes notched at apexes by the sharp pygofer edges. Pygofer enlarged and inflated. Aedeagus with a pair of short lateral terminal processes and a long slender ventral process that is twice the length of the lateral.

This is one of the most common grass-feeding species in Illinois and occurs abun-

dantly in meadow, pasture, and prairie habitats.

It is distributed over the eastern United States and west to Colorado.

**Illinois Records.**—Many males and females, taken May 30 to September 20, are from Alsip, Amboy, Antioch, Barry, Beach, Des Plaines, Evergreen Park, Fulton, Homer, Kankakee, Macomb, McHenry, Oak Lawn, Odin, Ogden, Oquawka, Orangeville, Palos Park, Pike, Princeton, St. Anne, Shawneetown, Summit, Urbana, Vienna, Wauconda, and White Pines Forest State Park.

### 7. *Flexamia pectinata* (Osborn & Ball)

*Deltocephalus pectinatus* Osborn & Ball (1897, p. 205).

Length 3.5–4.0 mm. Dorsum pale cinereous. Vertex, fig. 327K, one-fourth longer than basal width between eyes, with the usual marks at apex and on disc for the more typical members of the genus. Elytra with nervures pale, margined with fuscous; apical and discal cells darker. Face dark above, shading to pale below.

Female seventh sternite, fig. 328G, with posterior margin slightly concave and bearing four black comblike teeth on the central third; inner pair rounded and close together and separated by a notch from the outer pointed pair. Male plates, fig. 339, broad, almost parallel margined and broadly rounded to blunt almost truncate tips. Ventral keels of pygofer exposed between the plates at their apexes. Aedeagus simple, without terminal processes; very short curved basal portion extending anteriorly, with a pair of short dorsal processes.

This distinctive species occurs in a mixed association on the prairie and seems to live on *Bouteloua* grasses. It has been recorded from only the Middle West.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, Frison & DeLong, 3 ♂; Aug. 22, 1935, DeLong & Ross, 5 ♀. OGDEN: on prairie, July 1, 1934, DeLong & Ross, 1 ♀. WARREN: Aug. 28, 1934, Frison & DeLong, 1 ♀.

### 8. *Flexamia sandersi* (Osborn)

*Deltocephalus sandersi* Osborn (1907, p. 164).

Length 3.5 mm. Yellowish gray; vertex, fig. 327M, about one-third longer at middle than width between eyes at base, with the

pale tip enclosed in a darker circular or quadrate ring; margins with pale fuscous lines from apex to ocelli and with the usual transverse band and basal oblique marks. Nervures of elytra usually paler than surface; apical margin of each elytron and costal reflexed veins heavily bordered with dark fuscous.

Female seventh sternite, fig. 328I, with lateral margins rounding to median third of posterior margin, which is strongly produced into a broad tooth slightly incised at middle and black on either side. Male plates, fig. 342, broad at base, narrowed rapidly for two-thirds their length, then abruptly concave and strongly divergent, with acutely pointed apices. Aedeagus with two terminal anteriorly directed processes that are short and barbed.

This is another typical prairie species, which occurs on *Andropogon virginicus* and probably other species of the same genus. It is found in the eastern United States and west to Illinois.

**Illinois Records.**—ANVIL ROCK: Oct. 3, 1934, Frison & Ross, 1 ♀. CAVE IN ROCK: Oct. 3, 1934, Frison & Ross, 1 ♂, 1 ♀. DIXON SPRINGS: July 29, 1934, DeLong & Mohr, 1 ♀. EICHORN: Hicks Branch, June 13, 1934, DeLong & Ross, 2 ♂, 3 ♀. HIGH KNOB: Oct. 3, 1934, Frison & Ross, 1 ♀. LA RUE: July 11, 1934, DeLong & Ross, 1 ♀. SHAWNEETOWN: June 23, 1936, DeLong & Ross, 2 ♀. VIENNA: savanna grasses, June 14, 1934, DeLong & Ross, 3 ♂, 4 ♀; July 29, 1934, DeLong & Ross, 3 ♂, 4 ♀.

#### 9. *Flexamia bidentata* DeLong

*Flexamia bidentata* DeLong (1935a, p. 155).

Length 3.0–3.3 mm. Tawny, marked with brown. Vertex, fig. 327J, with the usual markings at apex and on disc. Veins of elytra heavily infuscated. Female seventh sternite, fig. 328M, with a large median tooth, which is bifid at apex, forming two sharp-pointed teeth. Male plates, fig. 340, similar to those of *visenda* (Crumb) (1915, p. 189) but broader at apices and more deeply notched on inner margins. Male pygofer without the broad conspicuous ventral flaps that overlap as in *visenda*. Male aedeagus with two terminal processes.

This species was described from Illinois and has been taken in two localities, both on the prairies.

**Illinois Records.**—ST. ANNE: Aug. 21, 1935, DeLong & Ross, 5 ♂, 10 ♀. ZION: June 25, 1934, Frison & DeLong, 2 ♂, 2 ♀; Aug. 7, 1935, Ross & DeLong, 5 ♂.

#### 10. *Flexamia reflexa* (Osborn & Ball)

*Deltocephalus reflexus* Osborn & Ball (1897, p. 203).

Length 4.0–4.5 mm. Pale cinereous, with dark markings. Vertex, fig. 327G, about one-fourth longer at middle than basal width between eyes; apex often ivory white, enclosed between crescent marks; marginal line to ocelli, transverse dashes before eyes, and oblique marks on base fuscous. Pronotum pale, with faint longitudinal stripes. Nervures of elytra margined with fuscous; spots on each clavus and on disc conspicuous; reflexed veins, apical margin of each elytron broadly bordered with fuscous.

Female seventh sternite, fig. 328J, with posterior margin almost truncate, central third roundedly and broadly produced into a tooth that is notched at center and has a large black spot on either side of notch. Male plates, fig. 341, long, rather narrow, and concavely and attenuately pointed. Aedeagus with three anteriorly directed terminal processes, one of which occurs on the dorsal side; the largest process with two spines on basal portion.

A common prairie species of the Middle West, *reflexa* has apparently been confused with other closely related species of *Flexamia*, thereby rendering many reports of its occurrence and abundance as unreliable.

**Illinois Record.**—OQUAWKA: sand prairie, July 30, 1936, Mohr & Burks, 1 ♀.

#### 11. *Flexamia prairiana* DeLong

*Flexamia prairiana* DeLong (1937a, p. 32).

Length 4.0–4.5 mm. Yellowish, closely resembling *reflexa*. Vertex about one-fifth longer at middle than basal width between eyes, with apical dark ring and cross band on disc. Elytra yellowish, veins bordered with brown, especially heavy along reflexed veins to each costa.

Female seventh sternite rather deeply emarginate on either side of the median produced third, which is rounded at apex and notched so as to form several minute teeth. Male plates, fig. 329, long, tapered to pointed apices, which are slightly divergent. Aedeagus bearing three anteriorly directed

processes as in *reflexa*, but differing by the absence of a process on the dorsal side and by having the large process on ventral side. In this species there is a finely serrate smaller lateral process.

This is a common species on sandy lake-bottom prairies and probably the most abundant species of this genus in the northern part of Illinois. It is known only from this state.

**Illinois Records.**—ALSIP: Aug. 23, 1934, DeLong & Ross, 11 ♂. EVERGREEN PARK: Aug. 23, 1934, DeLong & Ross, 41 ♂. SUMMIT: July 17, 1935, DeLong & Ross, 2 ♀. ZION: July 16, 1935, DeLong & Ross, 1 ♂.

### 12. *Flexamia picta* Osborn

*Deltocephalus pictus* Osborn (1907, p. 165).

Length 3 mm. Pale gray, vertex, fig. 327H, about one-fifth longer than width between eyes, a black circle at tip enclosing a pale spot; the usual marginal line, one or two transverse bands, and spots at base are present. Pronotum with prominent transverse band. Elytra with veins pale, usually heavily bordered with fuscous or black; central apical cell often entirely brown or black.

Female seventh sternite, fig. 328H, almost truncate, central third broadly and roundedly produced, two small incisions form a minute tooth at apex on either side of a median rounded lobe. Male plates, fig. 331, slightly and convexly rounded to blunt apices. Pygofers more than twice as long as plates. Aedeagus with two slender laterally directed apical processes.

This species occurs in the eastern United States, especially on hillsides and in certain prairie types where *Aristida gracilis* and related species grow in abundance.

**Illinois Records.**—Males and females, taken June 12 to October 3, are from Adair, Albion, Alton, Amboy, Anvil Rock, Barry, Cave in Rock, Dixon Springs, Dongola, Fairfield, Galena, Geff, Harrisburg, Kampsville, Marshall, Metropolis, Parker, Pike, Shawneetown, Vienna, and Watson.

### 13. *Flexamia imputans* (Osborn & Ball)

*Deltocephalus imputans* Osborn & Ball (1898, p. 75).

Length 3.5–4.0 mm. Creamy yellow, tinged with olive. Vertex, fig. 327I, about one-third longer at middle than width be-

tween eyes, a black spot on either side of pale apex. Reflexed veins of elytra broadly white, margined anteriorly with fuscous; outer apical cell of each elytron with the posterior margin fuscous. Face black, venter infuscated.

Female seventh sternite, fig. 328L, with emargination posteriorly on either side of a central broadly produced lobe that is angular and somewhat incised at center and has a black spot on either side. Male plates, fig. 332, gradually narrowed to rounded divergent tips.

This species has been recorded from Kansas, Iowa, and Wisconsin, and is found on *Muhlenbergia* growing in sheltered situations.

### 14. *Flexamia abbreviata* (Osborn & Ball)

*Deltocephalus abbreviatus* Osborn & Ball (1897, p. 206).

Length 3.0–3.25 mm. Pale, cinereous, with vertex markings nearly as in *reflexa*. Vertex, fig. 327L, at least one-third longer at middle than basal width between the eyes. Elytra with almost all the veins dark margined, reflexed veins and apical margin of each more heavily marked. Entire face infuscated.

Female seventh sternite, fig. 328K, with posterior margin excavated on either side of the central fourth, which is abruptly produced one-third the length of the segment, truncated, incised at middle, and slightly arcuate on either side, forming four rather distinct teeth. Male plates, fig. 330, convexly rounded from bases and slightly rounded from inner margins near tips to bluntly pointed apices. Pygofers narrow, greatly exceeding plates. Aedeagus curved, rather long, without apical processes; anterior dorsally curved portion bearing a bifurcate dorsal process with rather long ventrally directed arms.

Another of the prairie species, *abbreviata* occurs along with *pectinata* in the *Bouteloua hirsuta* association. It is recorded only from the Middle West and Texas.

**Illinois Record.**—THOMSON: July 8, 1934, DeLong & Ross, 21 ♂, 39 ♀.

### 52. *LATULUS* DeLong & Slesman

*Latulus* DeLong & Slesman (1929, p. 87).

Fig. 222. Vertex angularly produced, but usually not greatly longer than width be-

tween eyes. Reflexed arcs of front not visible from above. Elytra with short veinlets meeting each costa at about right angles but with no reflexed veins to costa; elytra usually short, just covering abdomen.

The species of this genus are typically wet meadow forms and with few exceptions occur in that habitat. Several are found at high mountain elevations. Eleven species are known for the United States, of which two have been collected in Illinois; two others may occur here.

#### KEY TO SPECIES

1. Color gray to dull green; length 4.0 mm. or more. Female seventh sternite, fig. 343, with a pair of median produced teeth. Male plates, fig. 344, shorter than combined basal width, apexes obliquely sloping.....1. *configuratus*  
Color some shade of brown; length not exceeding 3.5 mm. Female seventh sternite without median teeth. Male plates longer than combined basal width.....2
2. Female seventh sternite, fig. 343, deeply notched at either side, forming a broad median tooth. Male plates, fig. 344, divergent at apexes, sloping to outer margins.....2. *latidens*  
Female seventh sternite entire, not deeply notched. Male plates not divergent at apexes.....3
3. Female seventh sternite, fig. 343, concave. Male plates, fig. 344, sloping to inner pointed appressed apexes.....3. *sayi*  
Female seventh sternite, fig. 343, rounded. Male plates, fig. 344, broader at rounded apexes, not pointed on inner margins....4. *missellus*

#### 1. *Latulus configuratus* (Uhler)

*Deltocephalus configuratus* Uhler (1879, p. 511).

Length 4.0–4.5 mm. Gray to dull greenish. Vertex, fig. 343, flat, bluntly angled, wider between eyes than length at middle, marked with a white cross and with the margin pale. Pronotum usually marked by longitudinal bands. Nervures of elytra paler than adjacent areas, faintly margined with fuscous. Face pale fuscous.

Female seventh sternite, fig. 343, black on central half with the posterior margin concavely rounded on either side of a rather long pointed median tooth, which is usually bifid. Male plates, fig. 344, gradually sloping along outer margins; inner margins suddenly diverging at two-thirds their length and rounded to outer blunt apexes. Aedeagus short, apical fifth bifid.

This species has a northern range throughout Canada and the northern portion of the United States. It is common on *Poa compressa* and may occur in northern Illinois.

#### 2. *Latulus latidens* (Sanders & DeLong)

*Deltocephalus latidens* Sanders & DeLong (1919, p. 234).

Length 3 mm. The size, form, and appearance as for *missellus*, but distinguished

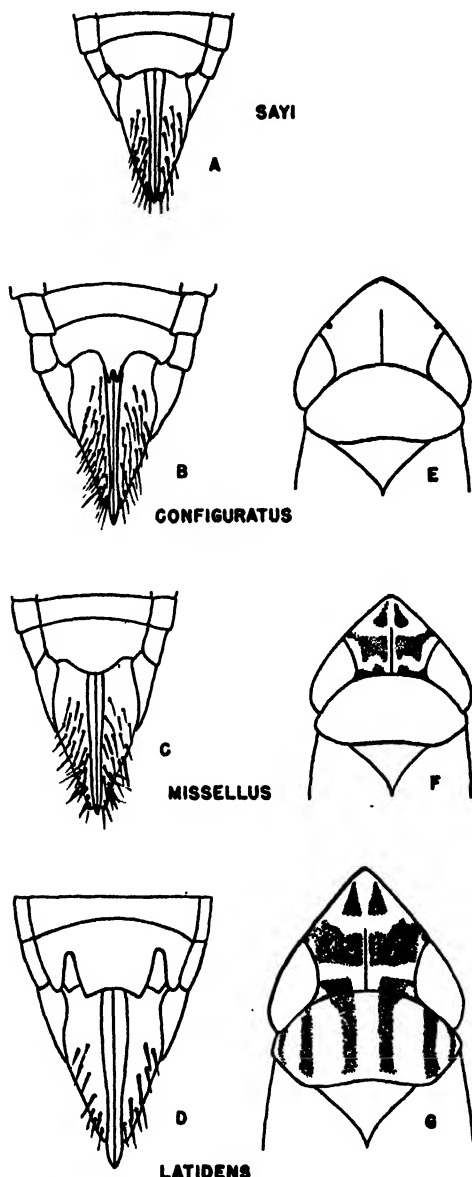


Fig. 343.—*Latulus*. A–D, female genitalia; E–G, heads and pronota.

by the external genital characters. Female seventh sternite, fig. 343, more than twice as long as preceding sternite, posterior margin deeply and roundedly incised near lateral margins for two-thirds the distance to base, leaving a broad central truncated tooth; tooth one-half the width of entire segment and produced beyond the lateral angles, the latter appearing as long, narrow, spatulate processes. Male plates, fig. 344, long, strongly divergent, inner margins curving to form bluntly pointed outer margins.

This species has been recorded only from Wisconsin and occurs in wet meadows and pastures.

### 3. *Latulus sayi* (Fitch)

*Amblycephalus sayi* Fitch (1851, p. 61).

Length 3.5 mm. Yellowish to brownish, with banded elytra. Vertex longer at middle than width between eyes, with four fuscous spots arranged in two somewhat concentric rows about the apex; anterior spots triangular, the posterior pair somewhat irregular in shape. Elytra each with two transverse pale bands, one at base and another just posterior to the middle; nervures of bands usually milky white.

Female seventh sternite, fig. 343, with posterior margin shallowly, concavely, and

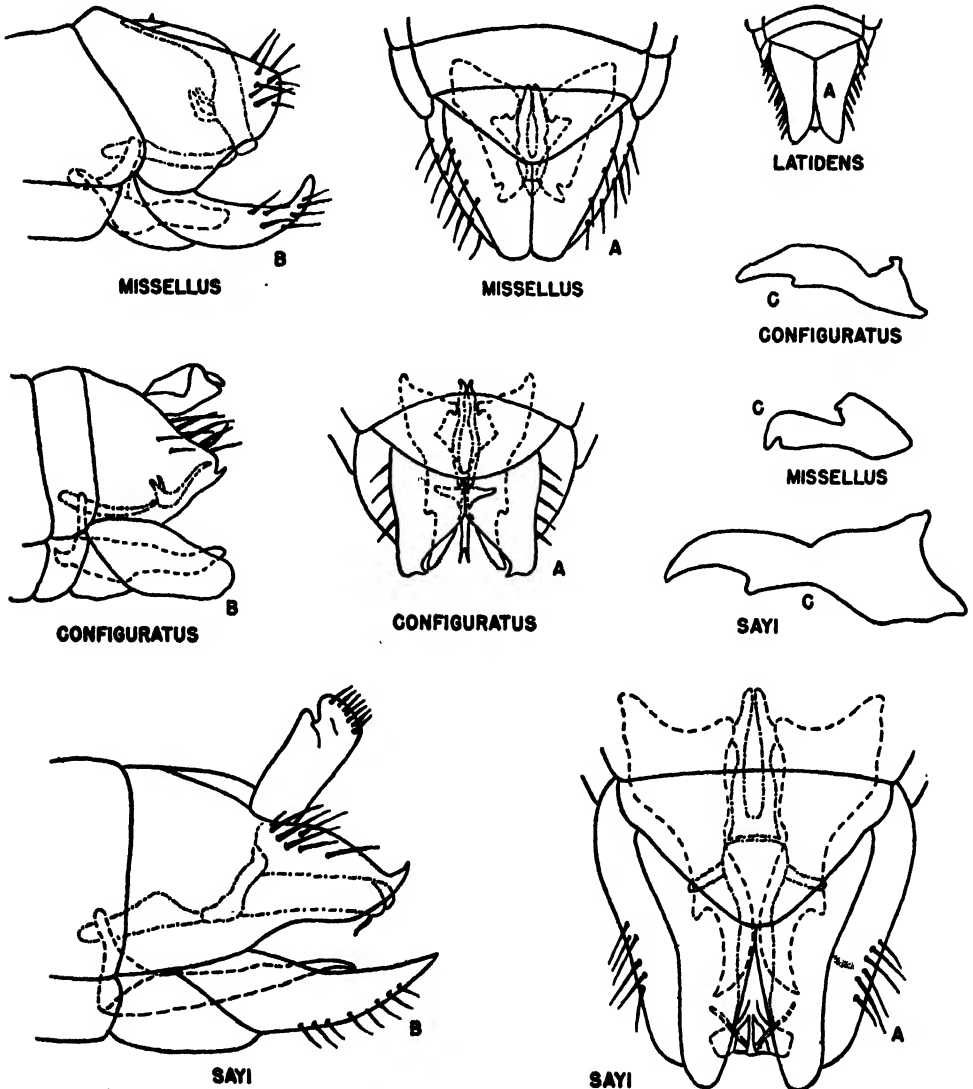


Fig. 344.—*Latulus*, male genitalia. A, ventral aspect; B, lateral aspect; C, style.

often sinuately rounded. Male plates, fig. 344, with outer margins slightly and concavely narrowed to near apices, where they are suddenly convexly rounded to the inner blunt apices. Aedeagus with two short lateral processes arising dorsally at base; apical portion broadened into winglike structures between which a pair of long slender processes arise and extend ventrally and anteriorly.

This is a common meadow and pasture species occurring upon bluegrass and probably other common grasses in these areas. It has a wide range over the eastern and middle western states.

**Illinois Records.**—Many males and females, taken from May 3 to November 13, are from Aldridge, Algonquin, Apple River Canyon State Park, Aurora, Browns, Cave in Rock, Decatur, Des Plaines, Dixon, Dolson, Dubois, East St. Louis, Eichorn, Elgin, Elizabethtown, Evergreen Park, Fern Cliff, Galena, Geff, Grand Detour, Hardin, Havana, Herod, Homer, Kankakee, Lima, Mahomet, Makanda, Marshall, Monticello, Muncie, Newton, Oakwood, Odin, Oregon, Palos Park, Princeton, Rago, Rock Island, St. Joseph, Seymour, Shawneetown, Thebes, Urbana, Vandalia, Vienna, Volo, Warren, Watson, White Heath, and White Pines Forest State Park.

#### 4. *Latulus missellus* (Ball)

*Deltocephalus missellus* Ball (1899b, p. 191).

Length 2.75–3.0 mm. Brownish, resembling *sayi* in general appearance but without distinct banding of the elytra. Vertex, fig. 343F, about as long as wide, pale, with the four brownish spots, as in *sayi*, separated by a white cross, and often with two other irregular spots near base. Elytra pale cinereous; nervures pale, irregularly margined with fuscous.

Female seventh sternite, fig. 343C, with the middle half of posterior margin convexly rounded, on either side of which it is shallowly concave to the lateral angles. Male plates, fig. 344, broad at bases, gradually narrowed to bluntly rounded and slightly divergent apices. Aedeagus with a pair of spinelike structures near the base; apex of dorsal portion pointed.

Distributed from Maine to Utah in the northern region of the United States, *missellus* occurs on grasses in meadows, open woodland, and pastures.

**Illinois Records.**—Many males and females, taken June 10 to October 7, are from Amboy, Antioch, Apple River Canyon State Park, Beach, Byron, Des Plaines, Duncans Mills, Elizabeth, Evergreen Park, Fox Lake, Galena, Grand Detour, Grays Lake, Hanover, Herod, Lima, New Milford, Oregon, Palos Park, St. Anne, Savanna, Volo, White Pines Forest State Park, and Zion.

#### 53. *PALUS* DeLong & Slesman

*Palus* DeLong & Slesman (1929, p. 85).

Fig. 221. Vertex variable in length and angle, margin not sharply defined. Elytra each with a definite but small appendix, with central anteapical cell constricted at center but not divided, outer anteapical cell quite small, sometimes almost obsolete; two or three costal veinlets slightly reflexed. Illinois species with dark spot inside posterior angle of inner apical cell.

The coloration and the form of the head vary decidedly among the species of this genus, but the genitalia are quite uniform. Leafhoppers of this genus live in marsh habitats or in very humid swampy woods. Seven species are recorded for the United States, and one of these has been taken in Illinois. Several others may occur in this state.

#### KEY TO SPECIES

1. Vertex ivory white, tinted with yellow, without dark markings, fig. 346B. . . . . 1. *luteocephalus*  
Vertex, pronotum, and scutellum with dark longitudinal stripes. . . . . 2
2. Vertex sharply angled, longer at middle than width between eyes, fig. 345B; length not exceeding 3.5 mm. . . . . 2. *delector*  
Vertex more bluntly angled, width and length nearly equal, fig. 347B; length 4.0 mm. or more. . . . . 3. *marginatus*

#### 1. *Palus luteocephalus* (Sanders & DeLong)

*Deltocephalus luteocephalus* Sanders & DeLong (1917, p. 84).

Length 3.5–4.0 mm. Vertex, fig. 346B, a little wider than median length, white to pale yellow, with a median black line on basal two-thirds. Anterior margin of pronotum ivory white, darker posteriorly. Scutellum yellow. Face pale yellow, immaculate, antennal pits black. Elytra smoky subhyaline; claval, discal, and apical cells



darker; costal reflexed veins and apical margin of each heavily bordered with fuscous; nervures conspicuously pale, narrowly margined with fuscous.

Female seventh sternite, fig. 346A, with posterior margin slightly and concavely excavated to a broad median U-shaped notch that has a slight incision at the center; a black spot on either side of notch. Male plates gradually narrowed to bluntly rounded apexes.

A marsh-inhabiting species occurring only in small numbers in this habitat, *luteocephalus* is recorded from Wisconsin and South Dakota. It has not yet been taken in Illinois.

## 2. *Palus detector* (Sanders & DeLong)

*Deltocephalus detector* Sanders & DeLong (1919, p. 233).

Length 3.0-3.5 mm. Vertex, fig. 345B, pointed, one-fourth longer at middle than width between eyes; creamy white, with two broad tawny bands extending from base to apex, where they converge and form two black triangular spots, one on either side of white apex, and extend over the margin; a narrow black curved line extending from eye around ocellus on margin toward apex. Pronotum whitish, with four longitudinal tawny bands; one behind each eye, and a central pair, the extension of the bands on vertex; bands continuing across scutellum. Elytra tawny, with costal, sutural, and apical margins and veins white. Each elytron with a spot on inner apical cell, reflexed veinlets, and posterior white margin black bordered.

Female seventh sternite, fig. 345A, with the posterior margin sinuately sloping to form a broad shallow median notch slightly indented at center, on either side of which is a round black spot. Male plates, fig. 345C, gradually sloping to broad subtruncate apices, inner apical third of each black, white margined. Male internal genitalia as in fig. 345D.

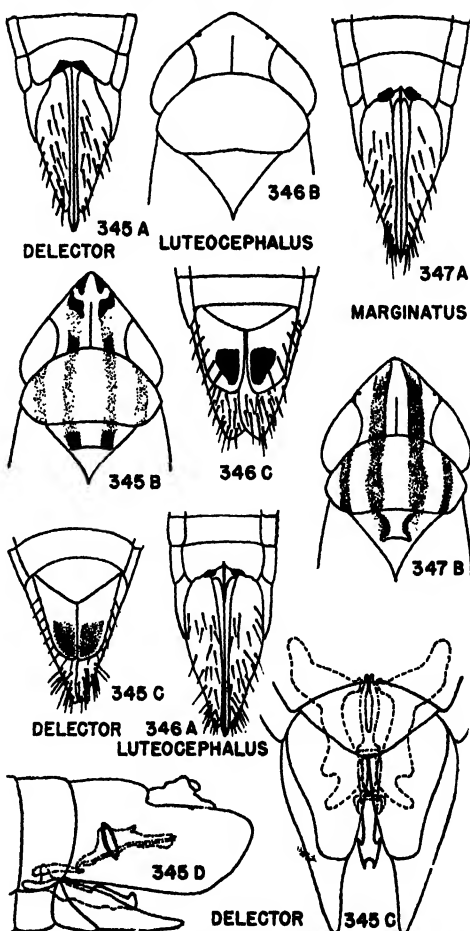
This species occurs on herbaceous plants in woodland areas and seems to be restricted to that association. It is found in the eastern part of the United States, ranging from Illinois to Maine.

**Illinois Records.**—OREGON: Castle Rock, June 30, 1935, DeLong & Ross, 5 ♂. WHITE PINES FOREST STATE PARK: June 30, 1935, DeLong & Ross, 5 ♂, 1 ♀.

## 3. *Palus marginatus* (DeLong)

*Deltocephalus marginatus* DeLong (1918a, p. 228).

Length 4 mm. Pale, with two longitudinal stripes. Vertex, fig. 347B, as long as basal width between eyes; two pale testaceous bands extending from apex of vertex to disc of scutellum, where they end in black spots, each band bordered interiorly by black broken lines that converge at apex; a black transverse band extending across margin of vertex and recurving on to vertex near eyes at each end. Pronotum with four longitudinal bands. Elytra pale testaceous, nervures white, heavily margined with fuscous along each claval margin and on apical portion; reflexed veinlets, posterior margins, and inner apical cells heavily marked.



Figs. 345-347.—*Palus*. A, female genitalia; B, head and pronotum; C, ventral aspect of male genitalia; D, lateral aspect of male genitalia.

Female seventh sternite, fig. 347A, with posterior margin sloping to a rather broad shallow U-shaped notch, slightly incised at center, a large oval black spot on each side of notch. Male unknown.

This is a fresh-water marsh species recorded from Maine, Wisconsin, and North Dakota. It occurs on either tall grasses or sedges.

### 54. *POLYAMIA* DeLong

*Polyamia* DeLong (1926a, p. 46).

Figs. 226, 348. Vertex rather short, bluntly angled, disc slightly convex or sloping forward, and thickly, rather bluntly

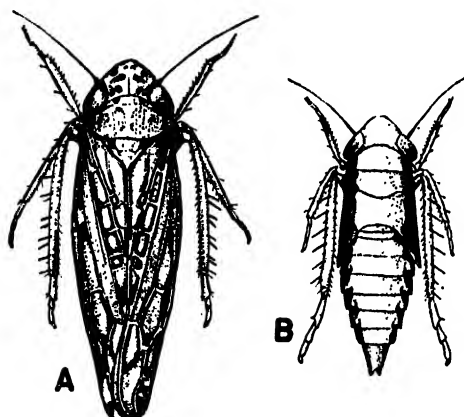


Fig. 348.—*Polyamia inimica*: A, adult; B, nymph. (From Osborn.)

angled with front. Elytra each with outer clavus strongly reticulate veined, central anteapical cell constricted and divided.

With few exceptions the species of the genus are grass feeders and frequent meadows, pastures, and prairies. Several seem to be quite restricted in food plant and habitat. About 35 species have been recorded for the United States, approximately half of which are known to occur in Illinois.

#### KEY TO SPECIES

1. Vertex with one or two narrow lines of recurved arcs which extend from front and are definitely visible on the dorsal curved margin of vertex, as in fig. 349A.....2
- Vertex often showing a heavy black coloring on either side of apex distinct from coloration of face, but usually without definite recurved narrow lines on margin of vertex, as in fig. 349C.....6

2. Females.....5
- Males.....3
3. Aedeagus, fig. 362, long, tapered to narrow tubular apex.....1. *obtecta*  
Aedeagus enlarged at apex, or apical portion broader than body of aedeagus, as in figs. 356, 357.....4
4. Aedeagus, fig. 357, with a circular apical enlargement notched on anterior dorsal border.....2. *rossi*  
Aedeagus, fig. 356, with a broad rather short terminal portion bearing a curved dorsal spur, and gradually narrowed apically to a blunt tip.....3. *similaris*
5. Posterior margin of seventh sternite, fig. 349X, rather broad, only slightly indented, forming three rather broad rounded lobes.....2. *rossi*  
Posterior margin narrower, indentations deeper and closer together, forming a more narrow bluntly and angularly produced lobe at center, lateral lobes narrower, figs. 349M, 349V.....1. *obtecta*, 3. *similaris*
6. Vertex not marked with definite spots or bands.....7  
Vertex marked with spots or transverse bands or both.....8
7. Entire insect pale yellowish, unmarked; elytra short, covering only first four or five segments.....4. *brevipennis*  
Vertex yellowish; elytra chestnut brown, with pale veins, apices broadly white.....5. *apicata*
8. A pair of large round black spots on anterior margins of vertex, on pronotum, and on basal angles of scutellum, fig. 349C.....6. *inimica*  
Without three pairs of black spots arranged on anterior margin of vertex, on pronotum, and on scutellum.....9
9. Vertex with a transverse fuscous band, broken at middle, or a transverse spot either side resembling an interrupted band.....10  
Vertex without interrupted transverse band or transverse spots.....15
10. Vertex angularly produced, longer at middle than width between eyes.....11  
Vertex not longer at middle than width between eyes.....13
11. Transverse band orange or tawny; vertex, fig. 349D, sharply pointed, one-fourth longer than wide; elytra heavily marked with fuscous, appearing obliquely banded.....7. *arundinea*  
Transverse band fuscous or brown; vertex more bluntly angled; elytra mottled, not appearing banded.....12
12. Robust, 3.5 mm. in length; male plates, fig. 350, longer than pygofer, longer than combined basal width; female seventh sternite as in fig. 349R.....8. *interrupta*  
More slender, not exceeding 3.0 mm. in length; male plates, fig. 360A, not exceeding pygofer, less than combined basal width; female seventh sternite as in fig. 349S.....9. *herbida*
13. Female seventh sternite, fig. 349P, entire, broadly and concavely excavated; male

plates, fig. 351, short, broad, apexes blunt.....10. *weedi*  
Female seventh sternite with very short

lateral margins exposing lobes of underlying segments at lateral angles, as in figs. 349*Q*, 349*U*. Male plates longer,

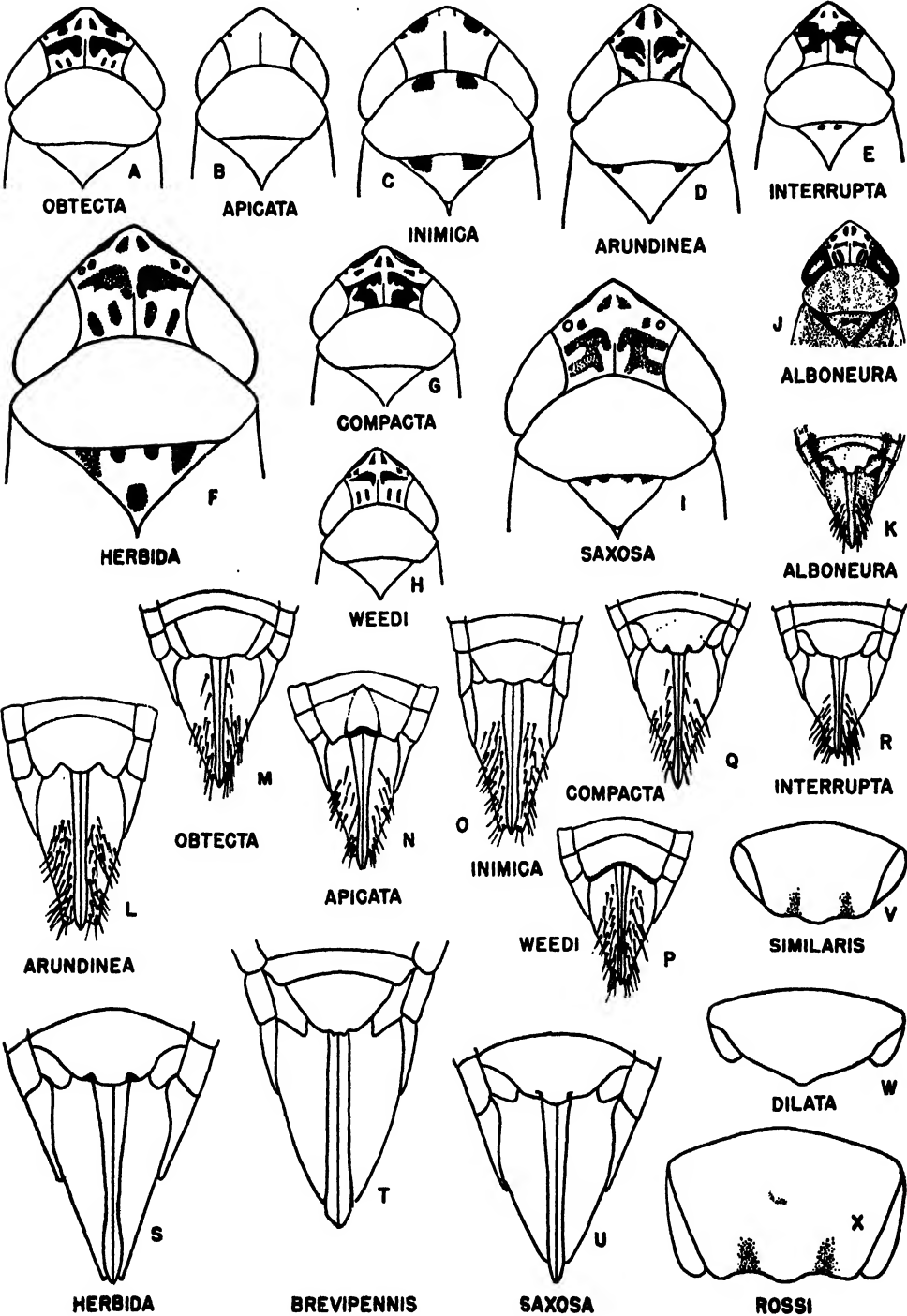


Fig. 349.—*Polyamia*. A-J, heads and thoraxes; K-X, female genitalia.

- concavely rounded to acute apices, as in figs. 355, 359*A*.....14
14. Median spots on apex of vertex, fig. 349*G*, conspicuous, band dark in color; male plates, fig. 355, longer than combined basal width; female seventh sternite as in fig. 349*Q*.....11. *compacta*  
Median spots of apex of vertex, fig. 349*I*, usually wanting, band faint; male plates, fig. 359, about as long as basal width; female seventh sternite as in fig. 349*U*.....12. *saxosa*
15. Length 3.5 mm.; elytra heavily infuscated, appearing obliquely banded.....7. *arundinea*  
Length less than 3.0 mm.; elytra mottled, not appearing banded.....16
16. Vertex, fig. 349*J*, with a distinct row of black spots above margin.....13. *alboneura*  
Spots above margin of vertex faint, the middle spots often wanting.....17
17. Yellowish, with four large faint black spots above margin; elytra infuscated.....4. *brevipennis*  
Pale brownish, a small round black spot next to each ocellus, a pair of faint triangular orange spots at apex of vertex separated by white lines. Veins of elytra broadly white, heavily margined with brown.....14. *dilatata*

### 1. *Polyamia obtecta* (Osborn & Ball)

*Deltocephalus obtectus* Osborn & Ball (1898, p. 78).

Length 3.0–3.5 mm. White to gray, marked with black and fuscous. Vertex, fig. 349*A*, almost one-fourth wider between eyes than median length, and whitish in color except following black or fuscous marks: reflexed arcs of face, a pair of spots just back of apex, another either side midway to eye, an irregular interrupted band, broadest at middle, between anterior margins of eyes, and an indefinite spot on either side behind band. Scutellum with a large black spot in each basal angle. Elytra with nervures broadly whitish, the cells darker, and the nervures bordered with fuscous.

Female seventh sternite, fig. 349*M*, appearing to arise abruptly from the preceding segment, not touching the pleura, produced more than twice the length of preceding segment to a truncated posterior margin; lateral lobes produced beyond median portion as rounded lobes. Male plates, fig. 362, triangular, broad at base, strongly and concavely narrowed to produced attenuated tips that are much shorter than pygofores. Aedeagus long, in lateral view appearing broadened at middle, bent caudally, and tapered to a narrow bent apex.

This is a common grass species in the eastern United States and Middle West in open grassy areas and upon the prairie.

**Illinois Records.**—Many males and females, taken June 13 to October 1, are from Alton, Billett, Dixon Springs, Eichorn, Fern Cliff, Fulton, Galena, Grand Detour, Hanover, Havana, Kankakee, Marshall, Oquawka, Oregon, St. Anne, Thomson, Vienna, and Watson.

### 2. *Polyamia rossi* DeLong

*Polyamia rossi* DeLong (1937*a*, p. 32).

Length 3 mm. Gray, marked with black, closely resembling *obtecta*. Vertex bluntly angled, as long at middle as basal width between eyes, with a pair of proximal pale spots, a darker spot next to either eye, and a black transverse band, which is broken at middle, between anterior margins of eyes. Thorax pale brownish, a black spot just back of each eye. Elytra white, veins bordered with brown; brown spots on middle of each clavus and disc of elytra.

Female seventh sternite, fig. 349*X*, with side margins sloping to posterior margin, which is almost truncate and dark margined; side lobes of underlying membrane conspicuous. Male plates, fig. 357, triangular, apices rather long, tapered to acute tips. Aedeagus in lateral view long, slender on basal two-thirds, then abruptly and greatly enlarged, the ventral portion broadly curved, semicircular, with a short apical process extending dorsally and anteriorly, and a basal dorsally directed spur.

This is a rather abundant species on grasses on the sand prairie in Illinois. It is known only from this state.

**Illinois Records.**—AMERICA: July 16, 1937, 1 ♀. FULTON: Aug. 22, 1935, DeLong & Ross, 26 ♂, 17 ♀. THOMSON: July 4, 1936, 2 ♀; Aug. 16, 1937, 1 ♂.

### 3. *Polyamia similis* DeLong & Davidson

*Polyamia similis* DeLong & Davidson (1935, p. 164).

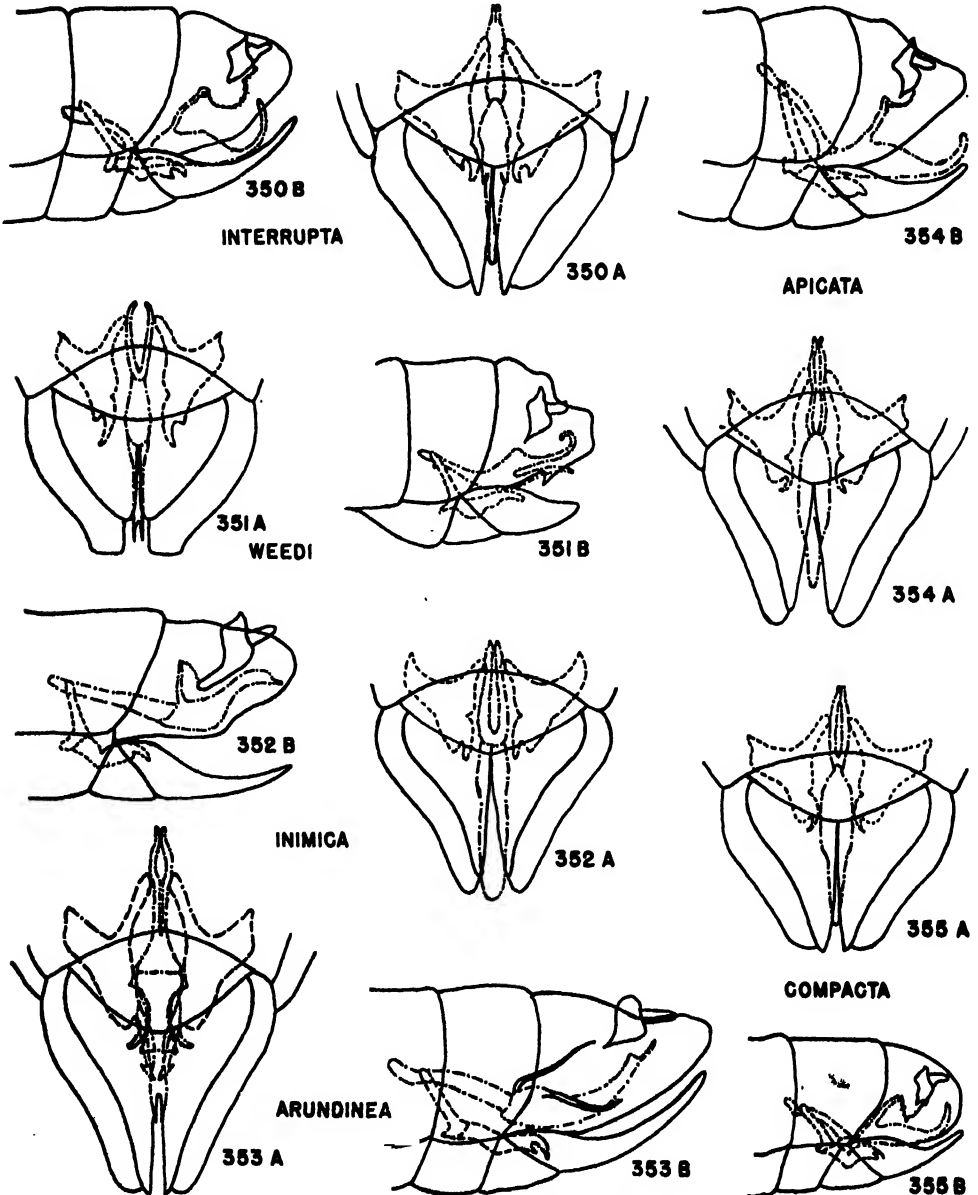
Length 3 mm. Gray, with dark markings, resembling *obtecta* in general appearance. Vertex bluntly angled, slightly wider between eyes than length at middle, with recurved arcs on either side of apex; a pair of proximal brown to black spots at apex, and one spot next to each ocellus, a broken

band between anterior margins of the eyes, and oblique markings either side on basal portion. Mottling on anterior margin of pronotum brown. Veins of elytra rather heavily infuscated.

Female seventh sternite, fig. 349V, produced rather abruptly on posterior margin, which is trilobate; central lobe slightly broader and not quite as long as the lateral lobes; lateral lobes of underlying membrane

conspicuous at sides of seventh sternite. Male plates, fig. 356, broad at base, short, triangular, one-third wider at base than long. Male aedeagus in normal position curved dorsally and with a dorsal curved finger-like spur.

This species is apparently southern in its distribution and has been taken in large numbers from grasses in southern Illinois. It resembles *obtecta* and *compacta* closely



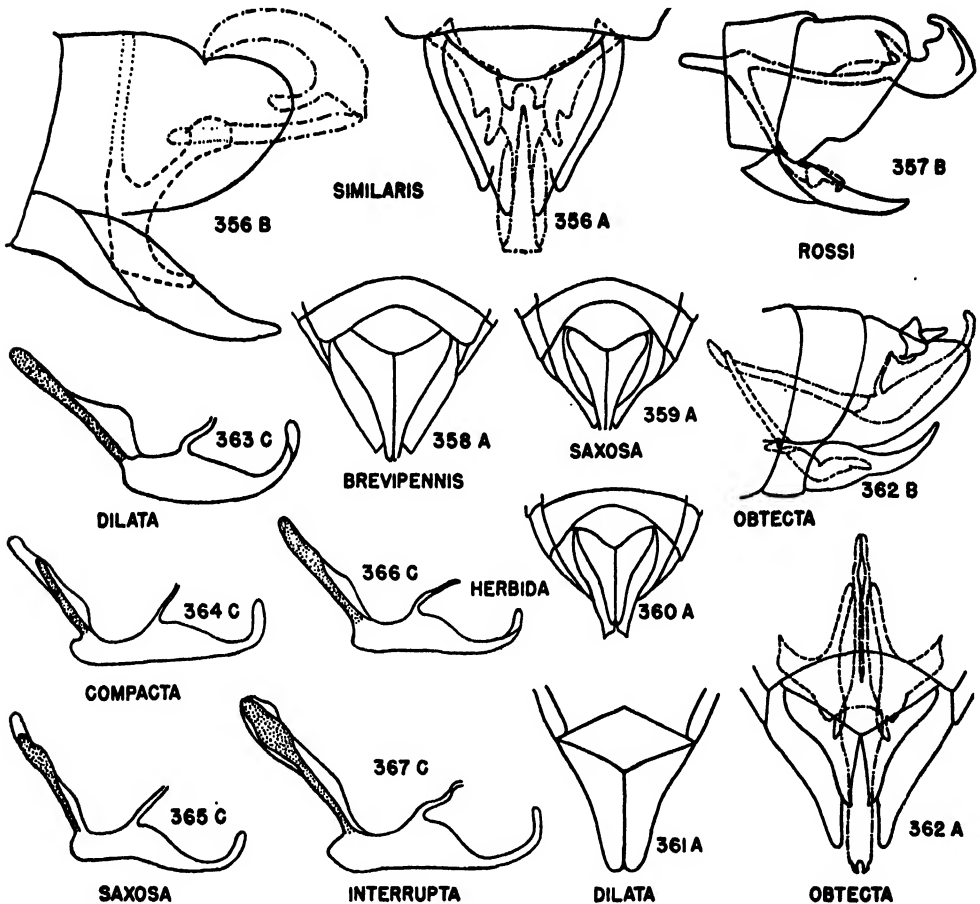
Figs. 350-355.—*Polyamia*, male genitalia. A, ventral aspect; B, lateral aspect.

and has apparently been confused with them previously.

**Illinois Records.**—Males and females, taken June 10 to October 3, are from Cave

spots on anterior margin of pronotum, veins of elytra heavily infuscated.

Female seventh sternite, fig. 349T, with short lateral margins; posterior margin con-



Figs. 356-367.—*Polyamia*, male genitalia. A, ventral aspect; B, lateral aspect; C, aedeagus.

in Rock, Dixon Springs, Eichorn, Fairfield, Galena, Hanover, Havana, Herod, High Knob, Luther, Marshall, Oquawka, St. Anne, Shawneetown, Vienna, and Watson.

#### 4. *Polyamia brevipennis* DeLong & Davidson

*Polyamia brevipennis* DeLong & Davidson (1933, p. 164).

Length 2.0-2.5 mm. Yellowish, short-winged; vertex frequently unmarked, bluntly angled, a little longer at middle than basal width between eyes; ocelli black; dark specimens with four large faint brownish

vexly rounded, with a slight notch on either side; lateral portions of underlying membrane conspicuously produced as lobes at either side. Male plates, fig. 358A, triangularly elongate, longer than combined basal width.

This species has been taken in a prairie habitat and also in moist open wooded areas in southern Illinois. It was previously recorded from Alabama.

**Illinois Records.**—CAVE IN ROCK: July 9, 1935, DeLong & Ross, 1♀. DIXON SPRINGS: July 9, 1935, DeLong & Ross, 2♂, 3♀. ELIZABETHTOWN: July 8, 1935, DeLong & Ross, 1♂.

### 5. *Polyamia apicata* (Osborn)

*Deltoccephalus apicatus* Osborn (1900b, p. 285).

Length 3 mm. Brown, with the head, anterior portion of pronotum, and caudal end of body pale yellow. Vertex, fig. 349B, bluntly angled, as long at middle as basal width between eyes; posterior portion of pronotum shading to brown; face often slightly darker than dorsal light areas of body; scutellum and elytra to apical transverse veins reddish brown, the nervures yellowish, apical cells yellowish hyaline.

Female seventh sternite, fig. 349N, very short at side margins, then abruptly produced, and semicircularly rounded, posterior margin bisinuate, with a brown spot on either side of middle producing trilobate appearance; underlying membrane deeply and concavely rounded, the only visible portions being the outer rounded lateral angles. Male plates, fig. 354, broad at bases, concavely rounded to narrow tips, which are produced almost the length of pygofers.

This is a very common prairie species in the eastern states and occurs on sandy areas and sand prairies on *Panicum villosissimum* and probably other species of this genus.

**Illinois Records.**—Males and females, taken June 12 to October 2, are from Apple River Canyon State Park, Beach, Cave in Rock, Dongola, Fern Cliff, Fulton, Galena, Geff, Grand Detour, Hanover, Harrisburg, Oquawka, St. Anne, Shawneetown, Thomson, Vienna, and Zion.

### 6. *Polyamia inimica* (Say)

*Jassus inimicus* Say (1831, p. 305).

*Jassus 6-punctatus* Provancher (1872, p. 378).

Length 4 mm. Grayish yellow, with a pair of black spots on vertex, pronotum, and scutellum; vertex, fig. 349C, bluntly angled, one-fourth wider between eyes than median length, a pair of minute spots at apex in addition to the pair of larger spots. Two large black spots on anterior margin of pronotum and one in each basal angle of scutellum. Elytra grayish, nervures broadly white, cells margined with fuscous.

Female seventh sternite, fig. 349O, short at lateral margins, then produced to posterior margin, which is trilobate; underlying membrane with prominent lateral angles. Male plates, fig. 352, concavely narrowed to pointed apices.

This is one of the most common species of North American leafhoppers, and is transcontinental in distribution. It is found abundantly in all types of vegetation, especially on grasses, both native and cultivated species.

**Illinois Records.**—Many males and females, taken May 8 to October 20, are from Aldridge, Algonquin, Alton, Amboy, Anna, Antioch, Anvil Rock, Apple River Canyon State Park, Atlas, Aurora, Barry, Beach, Bradley, Buckley, Bushnell, Cairo, Carman, Cave in Rock, Centralia, Champaign, Cornfield, Decatur, Des Plaines, Dixon Springs, Dolson, Dongola, Dubois, Duncans Mills, Eichorn, Elgin, Elizabeth, Elizabethtown, Evergreen Park, Fairfield, Forrest, Fox Lake, Fulton, Galena, Geff, Golconda, Grafton, Grand Detour, Grays Lake, Hardin, Harrisburg, Havana, Hillsboro, Ingleside, Justice, Kampsville, Kankakee, Keithsburg, Kirkwood, Lake Villa, Marshall, Mason City, Meredosia, Mokena, Momence, Monmouth, Monticello, Mount Carmel, Muncie, New Holland, Niota, Normal, Oak Lawn, Oakwood, Ogden, Onarga, Palos Park, Pecatonica, Pegrim, Plainview, Princeton, Putnam, Quincy, Rock Island, Round Lake, St. Anne, St. Joseph, Savanna, Seymour, Shawneetown, Sheffield, Sparta, Springfield, Starved Rock State Park, Summit, Taylorville, Thomasboro, Thomson, Tremont, Urbana, Ursa, Vandalia, Vienna, Virginia, Volo, Watson, Wilmington, White Heath, White Pines Forest State Park, and Zion.

### 7. *Polyamia arundinea* (Crumb)

*Deltoccephalus arundineus* Crumb (1915, p. 191).

Length 3.5 mm. Pale creamy, with black spots on vertex, pronotum, and scutellum and a cross on each elytron. Vertex, fig. 349D, almost one-fourth longer at middle than width between eyes; a pair of triangular spots near apex, and a spot each side midway to eye black; a pair of large irregular fuscous spots forming a somewhat broken band between anterior margins of eyes; a pair of oblique fuscous dashes at base. Pronotum with indistinct pale longitudinal bands and a black spot behind each eye. Basal angles of scutellum and apex each with a black spot. Elytra fuscous, nervures white, margined with fuscous, three conspicuous dark spots on each elytron; one each at middle of costa, middle

of clavus, and outer apical cell, the three together suggesting a cross band.

Female seventh sternite, fig. 349L, with posterior margin trilobate, central lobe shorter, broadly rounded, on either side of which is a rounded notch. Male plates, fig. 353, long, rather strongly and concavely narrowed and produced into long acute tips.

This is one of the abundant species living on cane, *Arundinaria tecta*, and apparently is restricted to that host plant, which occurs abundantly in the southeastern United States. It is found in the southern portion of Illinois, where the cane is distributed along the streams.

**Illinois Records.**—DOLSON: July 24, 1936, DeLong & Mohr, 1 ♂. ELIZABETH-TOWN: May 27, 1931, H. L. Dozier, 1 ♂. HEROD: Oct. 7, 1932, Ross & Burks, 1 ♂, 4 ♀; Aug. 4, 1934, DeLong & Mohr, 6 ♂, 11 ♀; May 29, 1935, Ross & Mohr, 1 ♂, 1 ♀; June 24, 1936, DeLong & Ross, 4 ♂, 15 ♀. KARNAK: Aug. 8, 1934, DeLong, Ross, & Mohr, 1 ♀. THEBES: July 11, 1935, DeLong & Ross, 1 ♂, 8 ♀. ULLIN: May 26, 1932, H. L. Dozier, 1 ♀. VIENNA: June 14, 1934, DeLong & Ross, 41 ♂, 32 ♀; July 10, 1935, DeLong & Ross, 2 ♂, 5 ♀.

#### 8. *Polyamia interrupta* (DeLong)

*Deltoccephalus interruptus* DeLong (1916, p. 51).

Length 3.5–3.7 mm. Dull yellowish to brownish, with black and fuscous markings. Vertex, fig. 349E, slightly longer than basal width; two large spots at apex, sometimes joined with reflexed coloration of the face, a smaller spot on either side between these and eyes, and an irregular transverse band, broadest at middle between anterior margins of eyes, black or dark brown. Pronotum with longitudinal dark stripes. Elytra testaceous, nervures white, heavily and irregularly bordered with fuscous.

Female seventh sternite, fig. 349R, strongly and convexly produced at median two-thirds from near its base; rounded lateral lobes conspicuous at sides and produced to a line through posterior margin of seventh sternite. Male plates, fig. 350, strongly and concavely narrowed to long acute apices. Male aedeagus, fig. 367C, with basal portion slender, enlarged at about half its length to a broader portion, which is constricted to a long narrow dorsally curved apical fourth.

This species has been taken rather abundantly in open wooded areas where there is a luxuriant growth of herbaceous vegetation. It occurs in the eastern United States and is often confused with *weedi*.

**Illinois Records.**—Males and females, taken June 14 to September 30, are from Dixon Springs, Dolson, Dubois, Eichorn, Elizabethtown, Golconda, Herod, Karnak, Muncie, St. Anne, and Vienna.

#### 9. *Polyamia herbida* DeLong

*Polyamia herbida* DeLong (1935a, p. 155).

Length 2.8–3.0 mm. Resembling *weedi* in form and coloration. Vertex, fig. 349F, bluntly angled, slightly longer at middle than width between eyes; a pair of black spots next to ocelli and a pair of proximal oblique dashes just above apex of vertex; a dark band between anterior margins of eyes and a brownish blotch on posterior portion of vertex on either side of middle. Pronotum brown, with five pale longitudinal stripes. Scutellum pale, with a dark spot in each basal angle. Elytra brownish, veins mostly dark margined; some of veins conspicuously milky white, particularly the inner vein of each clavus, crossveins of outer clavus, basal crossveins between sectors, crossveins of corium, and veins surrounding outer anteapical cell.

Female seventh sternite, fig. 349S, roundly produced, lobes of underlying membrane conspicuous at each side. Male plates, fig. 360A, rapidly narrowed and produced in long attenuate apices. Male aedeagus, fig. 366C, very similar in form to that of *compacta*.

Described from Illinois, this species has been collected only on the sand prairie.

**Illinois Records.**—HANOVER: June 29, 1935, DeLong & Ross, 26 ♂, 21 ♀; sand prairie, July 10, 1934, DeLong & Ross, 4 ♂, 5 ♀; Aug. 22, 1935, DeLong & Ross, 1 ♀. SAVANNA: June 29, 1935, DeLong & Ross, 1 ♂. THOMSON: sand prairie, July 8, 1934, DeLong & Ross, 1 ♀.

#### 10. *Polyamia weedi* (Van Duzee)

*Deltoccephalus weedi* Van Duzee (1892c, p. 306).

Length 3 mm. Dull yellowish, marked with black and fuscous. Vertex, fig. 349H, bluntly angled, as long as width between eyes, with four large black spots, the central



pair, just above apex, triangular, and an irregular brown band between anterior margins of the eyes; usually some indefinite markings at base of vertex. Pronotum faintly and longitudinally striped. Scutellum with a large brown spot in each basal angle and at apex. Elytra pale brown, nervures white, bordered with fuscous, cells usually dark in color.

Female seventh sternite, fig. 349P, with posterior margin rather evenly and strongly concave. Male plates, fig. 351, short and broad, triangular, apices bluntly angled. Aedeagus in lateral view appearing incised at apex more than half way to base, the dorsal portion curved dorsally and anteriorly at apex.

This is a very common grass-feeding species in the eastern half of the United States and is probably the most common species of the genus with the exception of *inimica*. It is commonly found in meadows, pastures, and other grassy areas.

**Illinois Records.**—Many males and females, taken June 10 to October 3, are from Aldridge, Alton, Anna, Apple River Canyon State Park, Brownfield, Browns, Bluff Springs, Cave in Rock, Dixon, Dixon Springs, Dolson, Dongola, East St. Louis, Eichorn, Elizabethtown, Fern Cliff, Fox Lake, Fulton, Galena, Gibsonia, Grand Detour, Grand Tower, Hanover, Havana, Herod, High Knob, Karnak, La Rue, Marshall, Monticello, Mount Carmel, Muncie, Newton, Oakwood, Oregon, Ripley, Rock Island, Shawneetown, Springfield, Starved Rock State Park, Thomson, Urbana, Vandalia, Vienna, White Heath, and White Pines Forest State Park.

#### 11. *Polyamia compacta* (Osborn & Ball)

*Deltocephalus compactus* Osborn & Ball (1897, p. 217).

Length 2.75 mm. Yellowish, vertex, fig. 349G, marked somewhat similarly to that of *weedi*, bluntly angled, one-fourth wider between eyes than length at middle; black line from face visible from above, the four spots behind anterior margin and the transverse band between eyes fuscous. Elytra tawny to fuscous, some of the nervures broadly white, most cells heavily margined with fuscous.

Female seventh sternite, fig. 349Q, very short at lateral margins, then strongly and

roundedly produced on median two-thirds, forming a slightly trilobate posterior margin; underlying membrane deeply and circularly emarginate, visible only as acute lateral angles at the sides of the seventh sternite. Male plates, fig. 355, broad at bases, rapidly and concavely narrowing and produced to long attenuated tips, which exceed the pygofer. Aedeagus as in fig. 364C.

This is a very short robust species common in grassy areas and frequently abundant in hillside pastures or on prairies. It is distributed through the eastern United States and occurs as far west as the states of Iowa and Kansas.

**Illinois Records.**—METROPOLIS: Aug. 18, 1891, 2♂, 1♀; Aug. 19, 1891, Shiga & Hart, 1♂. PARKER: Aug. 14, 1909, 2♀. ZION: Aug. 7, 1935, Ross & DeLong, 16♂, 21♀.

#### 12. *Polyamia saxosa* DeLong

*Polyamia saxosa* DeLong (1935a, p. 156).

Length 2.5–2.7 mm. Closely related to *compacta*. Vertex, fig. 349I, bluntly angled, about as wide between eyes as median length, pale straw yellow, with a pair of brownish quadrate spots, one next to either eye, and a pair of pale, orange, triangular spots at apex, an interrupted brownish band between anterior margins of eyes, and a dark area on posterior portion on either side of middle. Pronotum with dark spots on anterior portion. Scutellum pale, with a brown spot at apex. Elytra straw to pale brown; veins broadly white, with brown areas on apical, costal, and discal cells; each clavus white, with two brown elongated cells.

Female seventh sternite, fig. 349U, with side margins short, gradually sloping to broadly rounded posterior margin, which is slightly indented on either side of a median rounded lobe. Male plates, fig. 359, long, tapering to acute tips. Male aedeagus, fig. 365C, with apical constricted portion longer than in *compacta*, but otherwise very similar.

This species was taken from small grasses and herbaceous plants in a prairie habitat in Illinois and has not been recorded outside of this state.

**Illinois Record.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 6♂, 1♀.

13. *Polyamia alboneura* (DeLong)

*Deltocephalus alboneura* DeLong (1918b, p. 236).

Length 2.0–2.5 mm. Closely related to *apicata* but with black markings on vertex and with a more produced head. Vertex, fig. 349J, one-fourth longer at middle than basal width between eyes, pale yellow, with ocelli and four quadrate spots above margin black; a pair of transverse dashes between margins of eyes and a pair of oblique dashes on either side at base of vertex black or fuscous. Pronotum black, with five yellowish longitudinal stripes. Scutellum and elytra black, veins pale yellow. Face yellow, venter dark.

Female seventh sternite, fig. 349K, with posterior margin produced and appearing trilobate; visible portions of underlying membrane conspicuous as rounded lateral angles. Male plates concavely rounded to narrow tips, which are strongly produced.

Found in small numbers in grassy habitats, especially under humid conditions, this species is recorded from Mississippi, Tennessee, and the southern part of Illinois.

**Illinois Records.**—ELIZABETHTOWN: July 8, 1935, Ross & DeLong, 2♂. HEROD: July 6, 1935, DeLong & Ross, 3♂, 3♀. VIENNA: June 14, 1934, DeLong & Ross, 1♀.

14. *Polyamia dilata* DeLong

*Polyamia dilata* DeLong (1937a, p. 33).

Length 2.5–2.75 mm. Gray, resembling *compacta* in general appearance. Vertex bluntly angled, a little longer at middle than basal width between eyes; whitish in color, ocelli and an interior mesal spot black; a pair of proximal triangular spots just above apex pale brown, or orange; indications of a pale orange band at anterior margin of eyes and a pair of oblique marks each side at base; face dark, with pale arcs above. Pronotum brown, with pale longitudinal stripes. Scutellum pale brown. Elytra pale brown, veins broadly white, heavily margined with dark brown.

Female seventh sternite, fig. 349W, broadly and roundedly produced, with a slightly produced rounded lobe on central fourth; lateral lobes of underlying sternite conspicuous. Male plates, fig. 361A, long, concavely narrowed to acutely pointed

apexes. Aedeagus in lateral view, fig. 363C, with the body rather broad, scarcely narrowed anteriorly, posteriorly narrowed gradually to form a long apical third that is produced and curved caudally.

Occurring on prairie grasses in restricted habitats, this species has been taken in Illinois at only one locality, and is known only from Illinois.

**Illinois Record.**—APPLE RIVER CANYON STATE PARK: Aug 22, 1935, Ross & DeLong, 16♂, 18♀.

55. *DELTOCEPHALUS* Burmeister

*Deltocephalus* Burmeister (1838, pl. 14).

Vertex rather short, usually roundedly produced or bluntly angled, disc sloping or convexly rounding from pronotum to front, or with margin thick, scarcely angled with front. Ocelli close to the eyes and distinctly below the level of the disc. Venation of elytra simple, each central anteapical cell elongate, constricted, and usually divided.

The group of species in this genus can usually be recognized by the black coloration on the vertex in the form of spots, bars, and bands, which in some cases extend down along the eyes on the face, and by numerous heavy black arcs or bars on the face. The female seventh sternite is usually concave and frequently bears a sunken tooth.

About 35 species of *Deltocephalus* have been recorded for the United States; of these 7 are known to occur in Illinois. One or more others may eventually be found here.

## KEY TO SPECIES

1. Color uniform smoky brown, without definite markings; length 4.5 to 5.0 mm. . . . . 1. **fumidus**  
Not uniformly smoky brown; either black and usually with pale markings, or some shade of green or yellow; length not exceeding 3.5 mm. . . . . 2
2. Black in color or heavily marked with black or dark brown. . . . . 3  
Green or yellowish, marked with black spots or bands. . . . . 4
3. Dark brown to black, with several white spots on vertex, fig. 368C; anterior half of costal margins of elytra broadly yellow; length 3.0 mm. or more. . . . . 2. **flavicostus**  
Black, shiny, with few pale spots; costal margin not marked with yellow; length not more than 2.5 mm. . . . . 3. **gnarus**
4. Vertex with a broken band between anterior margins of eyes. . . . . 5  
Vertex without a broken band between

- anterior margins of eyes, a row of spots above margin.....8
5. With two small spots above apex of vertex.....6
- With a row of four spots above apex, fig. 368D.....7. **balli**
6. Band of vertex narrow, with an anterior projection at each end on inside margin of ocellus; body pale beneath.....7
- Band of vertex, fig. 368F, broad, irregular in outline, usually with a posteriorly projecting mark near each eye; body black beneath.....4. **nigriventer**
7. Elytra yellow, without dark markings.....5. **caperatus**

Elytra pale, heavily infuscated.....6. **gramus**

8. Median spots of vertex, fig. 368A, usually merged, forming a larger transverse marking just above apex.....9. **decisus**
- Median spots not merged or proximal, distinctly separated at middle.....9
9. Vertex with four black spots above margin, the median pair smaller and approximate; two pairs of oblique dashes on base.....8. **sonorus**
- Vertex spots on margin, fig. 368D, larger, the outer spots usually elongate; oblique spots on base of vertex.....7. **balli**

### 1. *Deltocephalus fumidus* Sanders & DeLong

*Deltocephalus fumidus* Sanders & DeLong (1917 p. 86).

Length 4.5–5.0 mm. Smoky brown, iridescent in color. Vertex, fig. 368E, bluntly angled, a little wider between eyes than length at middle, smoky, darker at apex, ocelli black, encircled with white. Elytra pale brown, nervures paler, narrowly brown margined.

Female seventh sternite, fig. 374C, with posterior margin truncate, slightly sinuate, and infuscated either side of middle; underlying membrane with prominent lobes visible at side of seventh sternite. Male plates, fig. 374A, long, broad at base, and concavely narrowed to pointed apices.

This species has been collected only in southern Wisconsin but it should eventually be found in northern Illinois.

### 2. *Deltocephalus flavicostus* Stål

*Deltocephalus flavicostus* Stål (1859, p. 53).

*Deltocephalus flavocostatus* Van Duzee (1892b, p. 116).

*Deltocephalus retrorsus* Uhler (1895, p. 78).

Length 3.0–3.5 mm. Dark brown to black, with costal margins of elytra yellowish. Vertex, fig. 368C, roundedly conical, wider between eyes than median length, with a pale spot enclosing each ocellus, a pale spot at tip of apex, three pale spots arranged concentrically behind apex, and pale spots at the base. Pronotum with faint traces of pale longitudinal lines. Elytra with veins usually paler, the anterior half of each costa usually broadly yellow, and the costal veinlets on posterior portion broadly white. Face black.

Female seventh sternite, fig. 369C, with posterior margin sinuate, forming four rather distinct lobes, the inner pair nar-

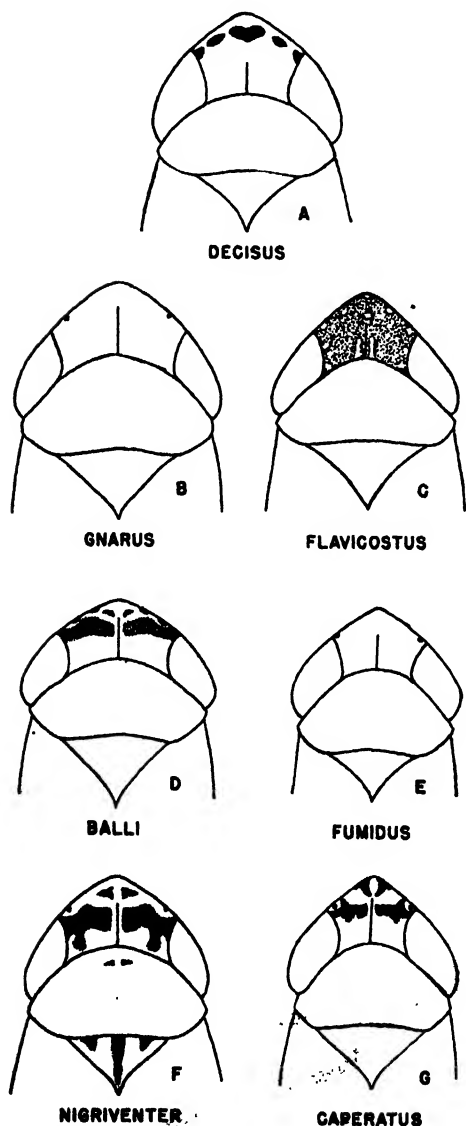
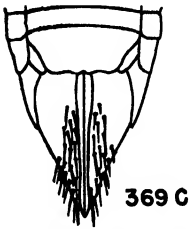


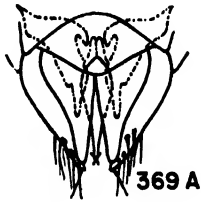
Fig. 368.—*Deltocephalus*. A–G, heads and pronota.

rower; lobes of underlying membrane visible at the sides. Male plates, fig. 369, gradually narrowed to blunt rounded tips.

Aedeagus with a dorsal spur at base, body curved dorsally, constricted on apical third, apex bluntly pointed.

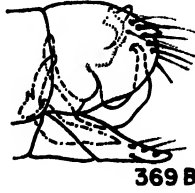


369 C

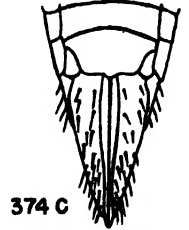


369 A

FLAVICOSTUS



369 B

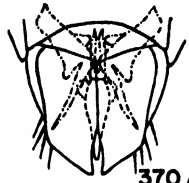


374 C

FUMIDUS

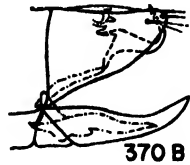


370 C



370 A

NIGRIVENTER



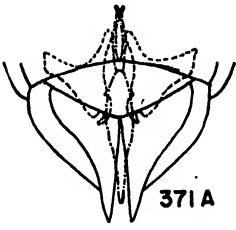
370 B



374 A

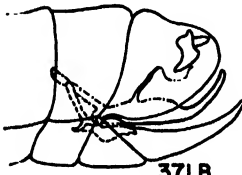


371 C

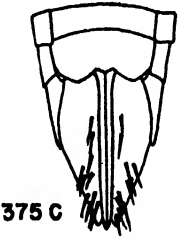


371 A

CAPERATUS

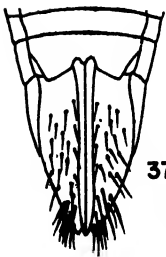


371 B



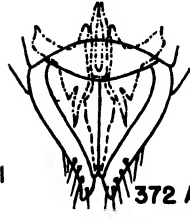
375 C

GNARUS

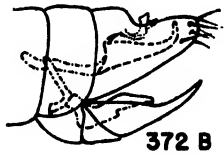


372 C

BALLI

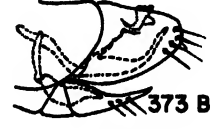


372 A



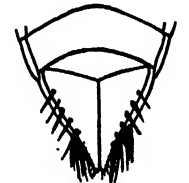
372 B

BALLI

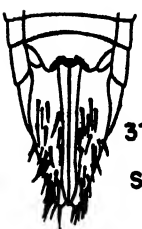


373 B

SONORUS

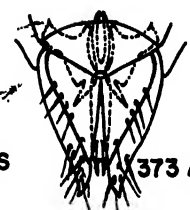


375 A

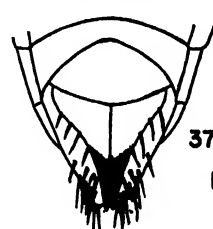


373 C

SONORUS

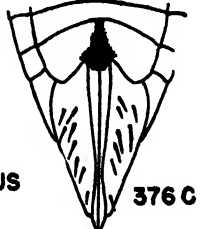


373 A



376 A

DECISUS



376 C

Figs. 369-376.—*Deltocephalus*. A, ventral aspect of male genitalia; B, lateral aspect of male genitalia; C, female genitalia.

This is a common grass-feeding species in the East and Middle West and occurs abundantly in almost every grassy area, especially in meadows and pastures.

**Illinois Records.**—Many males and females, taken from May 25 to November 4, are from Aldridge, Alto Pass, Amboy, Anna, Anvil Rock, Brownfield, Cave in Rock, Champaign, Clay City, Cobden, Decatur, Dixon Springs, Dolson, Dongola, Eichorn, Elizabethtown, Fern Cliff, Fountain Bluff, Fulton, Grand Detour, Grand Tower, Hardin, Harrisburg, Jonesboro, Karnak, Macomb, Marshall, Metropolis, Mount Carmel, Muncie, Normal, Oak Lawn, Oakwood, Pekin, Port Byron, Quincy, Shawneetown, Sparta, Springfield, Temple Hill, Urbana, Vandalia, Vienna, Villa Ridge, Virginia, and Watson.

### 3. *Deltocephalus gnarus* Ball

*Deltocephalus gnarus* Ball (1900c, p. 345).

Length 2.25–2.5 mm. Minute, shiny black. Vertex, fig. 368B, blunt, one-fourth wider between eyes than median length, a pale spot at apex often connected to a cross back of it, and sometimes connecting by lines to the circles around ocelli; a pair of pale oblique dashes from margin toward disc. Pronotum with a row of light submarginal spots, and with the posterior margin narrowly light. Scutellum black. Elytra white, subhyaline, veins milky; in the male the disc of each elytron is often smoky. Face black, with numerous dashes and pale arcs.

Female seventh sternite, fig. 375C, with posterior margin almost truncate; central fourth slightly indented, bearing a very minute blunt tooth at center; membranous plates exposed at sides of seventh sternite. Male plates, fig. 375A, slightly and roundly narrowed to pointed tips.

This is a minute species known previously from Iowa, South Dakota, and Tennessee. It closely resembles *Macrosteles potoria*, and the two species occur together on *Eleocharis* and similar aquatic plants. It has been taken in Illinois only in the central and northern parts of the state.

**Illinois Records.**—BEACH: July 25, 1934, Frison & DeLong, 2 ♀. CHAMPAIGN: Sept. 20, 1886, C. A. Hart, 1 ♀. OAK LAWN: July 1, 1935, DeLong & Ross, 26 ♂, 21 ♀. URBANA: May 27, 1889, C. A. Hart, 1 ♂.

### 4. *Deltocephalus nigriventer* Sanders & DeLong

*Deltocephalus nigriventer* Sanders & DeLong (1917, p. 85).

Length 2.5–2.75 mm. Yellow, robust, with dark markings. Vertex, fig. 368F, about two-thirds as long as basal width between eyes; yellow, with a pair of apical black spots just back of apex, and a broad sinuate black band, interrupted at middle, between anterior margins of eyes and ocelli. Pronotum pale; scutellum, spots in basal angles, and a median longitudinal stripe black. Elytra milky gray, subhyaline, each clavus irregularly mottled with brown; a large black spot on each discal cell, one on third anteapical cell, and another midway on costal margin. Nervures milky white. Face and venter black.

Female seventh sternite, fig. 370C, with posterior margin almost truncate and incised at middle almost to the base, the margins of incision almost overlapping. Male plates, fig. 370, broadly convex, tapering to rounded upturned blunt apices. Aedeagus short, rapidly tapered on basal half to a slender tapered upturned apical half, which is sharp pointed.

A northern species occurring in old pastures on grasses, *nigriventer* will probably be found in northern Illinois.

### 5. *Deltocephalus caperatus* Ball

*Deltocephalus caperatus* Ball (1900c, p. 343).

*Deltocephalus vinnulus* Crumb (1915, p. 192).

Length 3 mm. Pale yellow, with black markings. Vertex, fig. 368G, bluntly angled, about as long at middle as width between eyes, with black markings from the front extending on to vertex and forming a triangular spot on either side of apex, and a broken transverse black band between anterior margins of eyes. Elytra olive, subhyaline, veins whitish, sometimes narrowly fuscous margined. Face black above, with pale arcs, a black band along apex on the front.

Female seventh sternite, fig. 371C, with lateral margins short, lateral angles rounded to posterior margin, which is bisinuate, forming three lobes, the central one smallest; membranous lateral angles visible. Male plates, fig. 371, concavely narrowed and produced to gradually tapering acutely angled apices.

This species is commonly found in the *Andropogon virginicus* association, and apparently feeds on that plant. It is distributed through the eastern half of the United States and ranges west to Colorado.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: Aug. 22, 1933, DeLong & Ross, 1 ♀; July 11, 1934, DeLong & Ross, 4 ♂, 3 ♀. DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♀. EVERGREEN PARK: Aug. 23, 1934, DeLong & Ross, 1 ♂, 2 ♀. FERN CLIFF: Aug. 3, 1934, DeLong & Mohr, 2 ♀.

#### 6. *Deltocephalus gramus* (DeLong)

*Polyamia grama* DeLong (1935a, p. 156).

Length 2.3 mm. Yellowish, with black markings. Vertex bluntly angled, longer than basal width between eyes; a pair of large spots just back of apex; a broad transverse black band, broken at middle, extending between anterior margins of eyes; a portion of band arises at outer end and extends anteriorly, surrounding the ocelli; posterior half of vertex dark. Pronotum dark, marked with heavy black spots on anterior half. Elytra pale brown, veins lighter, margined with heavy brown infuscations; elytra appearing longitudinally striped. Face with a prominent curved marginal band just below vertex, extending down either side of face, and arcs of face dark brown.

Male plates rather broad at bases, rapidly narrowed to finger-like apices, which are greatly produced and acutely pointed.

Only two male specimens of this species are known, and these were taken in northern Illinois on grasses in prairie habitats.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: Aug. 27, 1934, Frison & DeLong, 1 ♂. CHICAGO: Sept. 16, 1930, D. M. DeLong, 1 ♂.

#### 7. *Deltocephalus balli* Van Duzee

*Deltocephalus nigrifrons* Van Duzee (1894c, p. 293). Name preoccupied.

*Deltocephalus balli* Van Duzee (1916, p. 71). New name.

Length 3.0–3.5 mm. Yellow to greenish, marked with black spots. Vertex, fig. 368D, bluntly angled, almost one-third wider between eyes than median length, usually with four spots above the front margin; the inner pair of spots may vary in size and

the outer pair are often short bands extending from margins of the eyes and interrupted at the middle. Pronotum usually pale anteriorly and darker posteriorly. Elytra smoky or olive subhyaline, nervures paler. Face black, with pale arcs.

Female seventh sternite, fig. 372C, with posterior margin sinuately sloping to a slightly excavated central portion that bears a minute black tooth at its apex; membranous lobes conspicuous at sides of segments. Male plates, fig. 372, broad at bases, convexly rounded to blunt tips, which equal or surpass pygofers. The aedeagus is short, gradually narrowed to a blunt upturned tip.

This species is abundant in meadows and pastures, and is commonly found throughout the northeastern United States.

**Illinois Records.**—Many males and females, taken from March to October 16, are from Albion, Algonquin, Alsip, Antioch, Beach, Dixon, Duncans Mills, Fox Lake, Fulton, Galena, Grafton, Gulfport, Havana, Homer, Karnak, Luther, McHenry, Mount Carmel, Muncie, Oak Lawn, Oquawka, Pere Marquette State Park, Port Byron, Putnam, Savanna, Sheffield, Summit, Urbana, Vienna, Volo, Watson, Wauconda, Waukegan, and Zion.

#### 8. *Deltocephalus sonorus* Ball

*Deltocephalus sonorus* Ball (1900c, p. 344).

Length 3.25 mm. Slender, green to yellowish, marked with black spots. Vertex rounded at apex, one-fourth wider between eyes than median length, with four black spots on the anterior margin; inner pair usually quadrate and smaller than outer; usually a pair of elongate fuscous spots on either side of middle at base, and a pair on disc. Pronotum with five yellowish longitudinal stripes. Elytra olive to yellowish, subhyaline, veins pale, often margined with fuscous.

Female seventh sternite, fig. 373C, with posterior margin slightly excavated and with a short produced rounded median lobe. Male plates, fig. 373, broad at bases, gradually narrowed to acute tips. Aedeagus rather short, curved dorsally on apical third, narrowed, and with a bluntly pointed apex.

This species occurs upon grasses and many cultivated crops, for example, wheat, clover, and alfalfa, and it can be found in abundance in pastures, meadows, and other open

habitats where grasses are common. It is widely distributed from Florida through the Middle West to Arizona and California.

**Illinois Records.**—ALTON: June 26, 1934, DeLong & Ross, 2 ♀. AMBOY: Aug. 8, 1934, DeLong & Ross, 1 ♀. EVERGREEN PARK: Aug. 23, 1934, DeLong & Ross, 1 ♂. GIBSONIA: Oct. 2, 1934, Frison & Ross, 1 ♀. HAVANA: Aug. 8, 1934, Frison & Mohr, 3 ♂, 8 ♀. OQUAWKA: July 30, 1936, Mohr & Burks, 1 ♀. VIENNA: on cane, June 14, 1934, DeLong & Ross, 1 ♀.

#### 9. *Deltocephalus decesus* DeLong

*Deltocephalus decesus* DeLong (1926a, p. 55).

Length 2.5 mm. Straw yellowish, with black spots. Vertex, fig. 368A, as long at middle as basal width, the sides convexly rounded, with a large black transverse spot just behind apex, this spot sometimes divided into two separate spots; also an elongated black spot on either side along margin midway to eye and a smaller one next to each eye; margin of vertex milky white between this row of spots and a heavy black band on front just below margin. Elytra brownish yellow, subhyaline, nervures paler. A black spot on last dorsal tergite of both sexes.

Female seventh sternite, fig. 376C, with posterior margin broadly and angularly excavated one-third the distance to base and bearing a broad blunt tooth at apex. Male plates, fig. 376A, broad at bases, concavely narrowed and produced into long blunt processes, these black on either apical half.

This is another grass-feeding species that is not found abundantly but seems to occur in moist habitats on short grasses. It was previously recorded from Florida only, and has been taken in southern Illinois.

**Illinois Records.**—SHAWNEETOWN: June 23, 1936, DeLong & Ross, 1 ♂. VIENNA: June 14, 1934, DeLong & Ross, 1 ♂, 1 ♀.

#### 56. *LONATURA* Osborn & Ball

*Lonatura* Osborn & Ball (1898, p. 83).

Fig. 203. Head conically and obtusely angled, pronotum with posterior margin truncate. Macropterous form with long narrow elytra, appendix large, venation obscure. Brachypterous form with short elytra, covering second abdominal segment; wings rudimentary, venation obscure.

The species of this genus are grass-feed-

ing forms and as far as known live in prairie habitats or upland pastures and meadows. Eleven species and one variety are known to occur in the United States, and one of these has been taken in Illinois.

#### 1. *Lonatura catalina* Osborn & Ball

*Lonatura catalina* Osborn & Ball (1898, p. 83).

Length of macropterous form 2.75 mm.; brachypterous 1.8–2.25 mm. Vertex about as long as basal width. Macropterous form greenish gray, vertex tinted with yellow; eyes black. Brachypterous form, fig. 238C, uniform creamy white or orange in color, vertex and face often yellow; pronotum and elytra brown, and abdomen almost black.

Female seventh sternite emarginate posteriorly, with a bilobed process. Male plates small, triangular, apexes produced.

In the Middle West this is a very abundant species in the *Aristida gracilis* association, and is frequently found on hillside pastures or in areas that have been denuded and where *Aristida* is the pioneer vegetation. It also occurs in sand prairies and certain of the more moist prairies.

**Illinois Records.**—CAVE IN ROCK: Oct. 2, 1934, Frison & Ross, 1 ♂, 2 ♀. HARDIN: June 27, 1934, DeLong & Ross, 43 ♂, 39 ♀. HEROD: July 8, 1935, DeLong & Ross, 1 ♀.

#### 57. *HEBECEPHALUS* DeLong

*Hebecephalus* DeLong (1926a, p. 58).

Fig. 227. Vertex bluntly angled, disc usually flattened, margin thickened and bluntly angled with front. Elytra usually rather long, central anteapical cell of each elongated, strongly constricted at middle, enlarged at either end, and decidedly produced beyond the other anteapical cell.

More than 30 species of *Hebecephalus* have been recorded for the United States, nearly all of which occur in the West. Only two of these species are found in the East, and they have been collected in Illinois.

#### KEY TO SPECIES

1. Vertex wider than long; female seventh sternite, fig. 377D, with a deep narrow abrupt excavation at center; male plates, fig. 377C, broad, shorter than combined width at base, apexes truncate. . . . . 1. *signatifrons*  
Vertex as long as wide; female seventh sternite, fig. 377D, sinuate or truncate, not excavated; male plates, fig. 377C,

as long as combined basal width, more narrowed, wedge shaped. .2. *cruciatus*

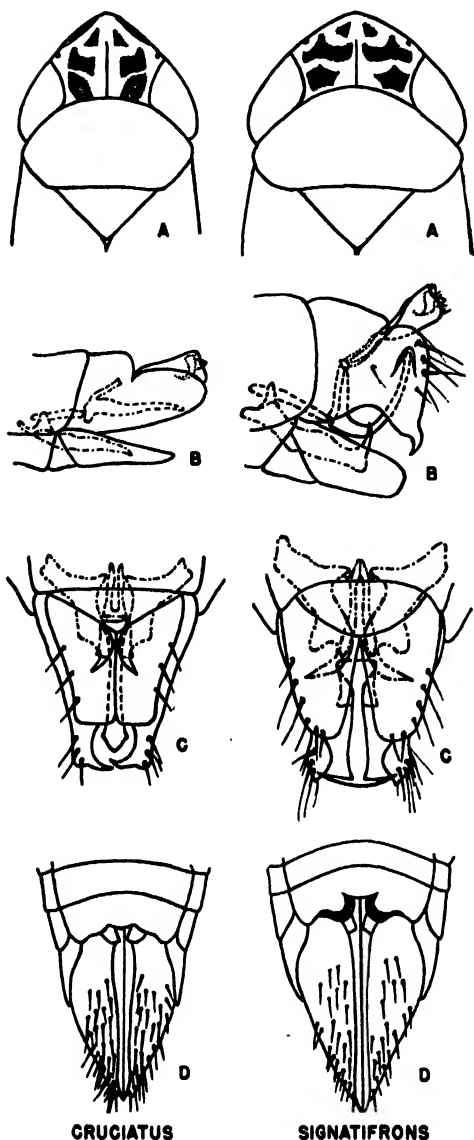


Fig. 377.—*Hebecephalus*. A, head and pronotum; B, male genitalia, lateral aspect; C, male genitalia, ventral aspect; D, female genitalia.

### 1. *Hebecephalus signatifrons* (Van Duzee)

*Deltocephalus signatifrons* Van Duzee (1892c, p. 305).

Length 3.0–3.5 mm. Pale yellow to gray, with fuscous markings. Vertex, fig. 377A, bluntly angled, about one-third wider be-

tween eyes than length at middle; ocelli, a pair of marginal dashes close to apex, a pair of large rectangular spots behind these, each with a spur extending to margin, and a pair of large round spots on base fuscous. Pronotum with traces of five pale longitudinal stripes. Elytra gray, nervures pale, margined with fuscous, often appearing banded by heavy fuscous markings.

Female seventh sternite, fig. 377D, with posterior margin shallowly and concavely rounded between prominent lateral angles and a pair of large rounded median lobes; lobes separated by a square notch extending almost half way to the base; at the bottom of notch a broad tooth is slightly produced. Male plates, fig. 377C, broad at bases, gradually narrowed to very broad rounded apices. Aedeagus, fig. 377B, with a pair of apical spines directed laterally.

This species, which is western and middle western in distribution, occurs commonly on grasses and herbaceous vegetation. It has been reported as living in the *Setaria-Panicum* association.

**Illinois Records.**—Males and females, taken May 30 to September 20, are from Apple River Canyon State Park, Beach, Decatur, Dixon, Fulton, Grand Tower, Herod, Homer, Karnak, Muncie, Seymour, Springfield, Starved Rock State Park, Summit, Urbana, Wauconda, and Zion.

### 2. *Hebecephalus cruciatus* (Osborn & Ball)

*Deltocephalus cruciatus* Osborn & Ball (1898, p. 77).

Length 2.75–3.0 mm. Pale gray, resembling *signatifrons* but smaller. Vertex, fig. 377A, bluntly angled, length equaling basal width between eyes. Frontal arcs extending over margin, a pair of fuscous triangular spots just back of apex, two irregular fuscous oblique spots between ocelli, and a pair of fuscous spots on each side at base. Pronotum with five pale longitudinal stripes. Scutellum with four small spots along anterior margin. Elytra whitish, nervures pale, margined with fuscous, a few cells often quite dark.

Female seventh sternite, fig. 377D, with posterior margin slightly concave and sinuate. Male plates, fig. 377C, broad at base, gradually narrowed to truncate tips, which are one-half as wide as at base. Aedeagus in lateral view, fig. 377B, tapered to a nar-



row apex; in ventral view widened just before apex and bluntly pointed.

This species, reported previously from North Dakota and Iowa, occurs on prairie plants in the prairie habitat.

**Illinois Records.**—DECATUR: June 29, 1935, Frison & Mohr, 1 ♀. FULTON: Aug. 22, 1935, DeLong & Ross, 2 ♂, 8 ♀. HANOVER: sand prairie, July 10, 1934, DeLong & Ross, 1 ♂, 1 ♀; June 29, 1935, DeLong & Ross, 10 ♀; Aug. 22, 1935, DeLong & Ross, 7 ♂, 8 ♀. ST. ANNE: July 20, 1934, DeLong & Ross, 2 ♂, 1 ♀. THOMSON: July 8, 1934, DeLong & Ross, 5 ♂, 2 ♀; June 30, 1935, DeLong & Ross, 21 ♀; Aug. 16, 1937, 1 ♀. ZION: July 16, 1935, DeLong & Ross, 1 ♀.

### 58. *LAEVICEPHALUS* DeLong

*Laevicephalus* DeLong (1926a, p. 64).

Vertex varying from a sharply angled and pointed type, the vertex acutely angled with front, to a rather bluntly angled type with sides often rounding to apex, and with vertex bluntly angled with front. Vertex flattened on disc. Venation simple.

With few exceptions the species belonging to this genus are some shade of green or yellow, quite uniform in color, and without dark markings.

About 60 species of *Laevicephalus* have been described for the United States, 9 of which are known to occur in Illinois. As far as is known, practically all of them are grass feeders and are usually found in pastures and meadows.

#### KEY TO SPECIES

1. Vertex longer than basal width between eyes, usually distinctly angled and pointed, occasionally with tip more blunt.....2  
Vertex broader between eyes than length at middle, or, if as long, then with apex roundedly pointed, not sharply angled.....7
2. Length not more than 3.0 mm.....3  
Length more than 3.5 mm.....5
3. Dull yellowish, with two broad longitudinal brown stripes extending across pronotum to scutellum.....*1. shingwauki*  
Greenish or greenish yellow, with definite dark markings.....4
4. Female seventh sternite, fig. 386E, narrowly incised at middle, a round black spot on either side. Male plates, fig. 382A, convexly rounded, almost as long as pygofer, apices angled.....*2. minimus*

- Female seventh sternite, fig. 386H, with a broad shallow excavation; male plates, fig. 381, shorter, apices broadly rounded, almost truncate.....*3. melsheimeri*
5. Female seventh sternite, fig. 386G, sinuate, with three small lobes at center; male plates, fig. 379, tapered and abruptly narrowed to narrow attenuated apices.....*4. unicoloratus*  
Female seventh sternite distinctly produced at center, as in fig. 386I; apices of male plates not attenuated, but narrowed and pointed.....6
  6. Female seventh sternite, fig. 386I, with median third abruptly produced and truncated. Male plates, fig. 383, with tips quite broad, bluntly pointed and divergent.....*5. sylvestris*  
Female seventh sternite, fig. 386A, with median half gradually produced to a pointed brownish tooth. Male plates, fig. 378, tapered to narrowly rounded tips.....*6. acus*
  7. Greenish, with two parallel brownish stripes on vertex, on pronotum, and on scutellum.....*7. concinnus*  
Greenish, without parallel brownish stripes.....8
  8. Female seventh sternite, fig. 386F, produced and incised at middle; male plates, fig. 385, strongly and convexly rounded to broad blunt apices.....*8. orientalis*  
Female seventh sternite, fig. 386B, produced but not incised; male plates, fig. 380, narrowed to pointed apices.....*9. pravus*

### 1. *Laevicephalus shingwauki* Beamer & Tuthill

*Laevicephalus shingwauki* Beamer & Tuthill (1934, p. 19).

Length 2.5–3.0 mm. Dull yellow, with black markings. Vertex slightly longer than width between eyes, with two dark almost parallel broad stripes extending across pronotum to scutellum. Elytra somewhat smoky. Male and female with two large black spots on last abdominal segment, spots of female smaller. Female seventh sternite, fig. 386D, with posterior margin produced at middle into a broad tooth. Male plates, fig. 384A, broad at bases, slightly converging to broad truncate apices. Male aedeagus, fig. 384B, short, broad, cylindrical, a narrow process arising on dorsocaudal margin, bifurcate near its base, the two processes long, curved laterally and ventrally.

This is an abundant species in the freshwater marshes of Illinois, occurring on tall grasses that grow in clumps. It is known only from this state and Minnesota.

**Illinois Records.**—Males and females,

taken June 30 to September 18, are from Amboy, Beach, Des Plaines, Fox Lake, Oak Lawn, St. Anne, Summit, Volo, Waukegan, and Zion.

2. *Laevicephalus minimus* (Osborn & Ball)

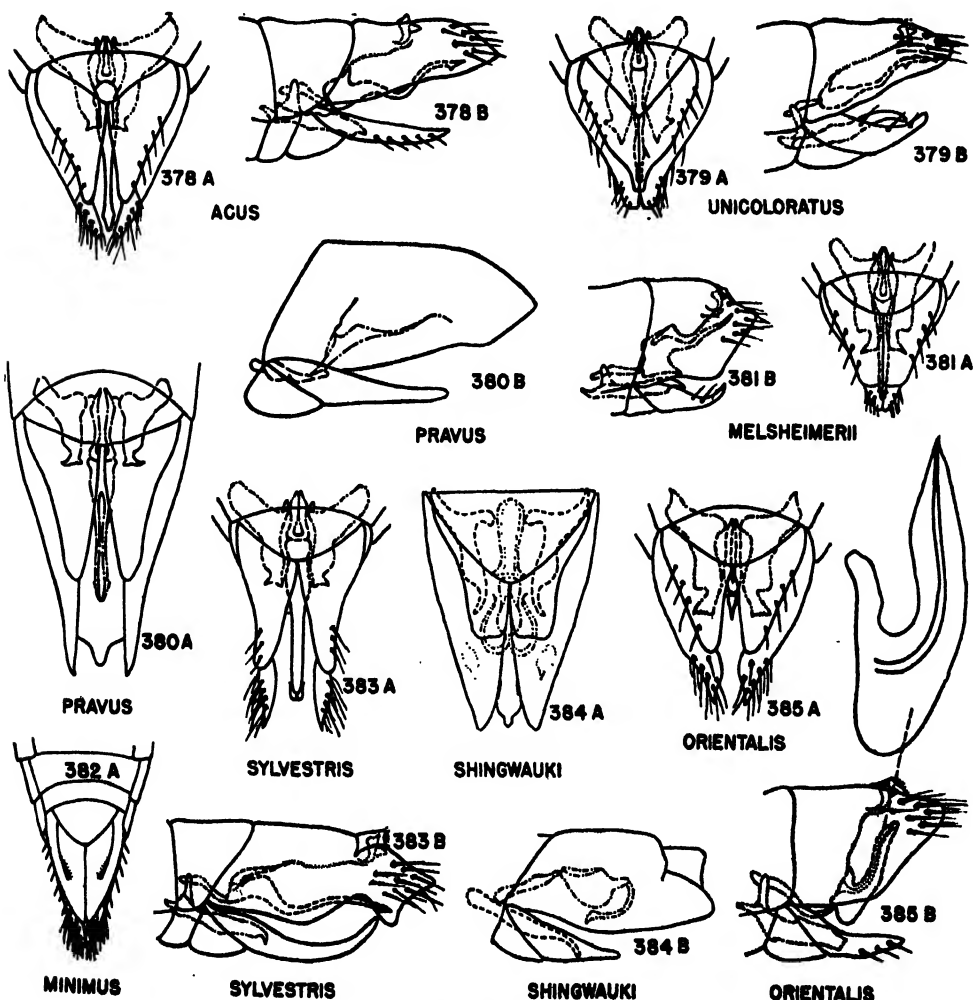
*Deltocephalus minimus* Osborn & Ball (1897, p. 211).

Length 2.5–3.0 mm. Small, greenish yellow, with a bluntly angled vertex. Paler on vertex, with traces of two brownish arcs on each side extending from apex toward ocellus. Elytra milky hyaline, nervures yellowish, faintly bordered with fuscous, especially in male. Face dull brownish. Female seventh sternite, fig. 386E, with posterior

margin roundedly produced, narrowly incised at middle, with a very small rounded notch on either side, median third black margined. Male plates, fig. 382A, tapering to bluntly pointed tips, almost as long as the pygofers and each bearing a black spot at middle.

This is a middle western species, and has been found on grasses of the genus *Stipa* in the *Sporobolus-Stipa* habitats of northern Illinois.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, Frison & DeLong, 7 ♂, 3 ♀; Aug. 22, 1935, DeLong & Ross, 2 ♂, 1 ♀. WARREN: Aug. 28, 1934, Frison & DeLong, 1 ♂, 5 ♀. WHITE PINES FOREST STATE PARK: Aug. 27, 1934, Frison & DeLong, 69 ♂, 69 ♀.



Figs. 378–385.—*Laevicephalus*, male genitalia. A, ventral aspect; B, lateral aspect.

### 3. *Laevicephalus melsheimerii* (Fitch)

*Amblycephalus melsheimerii* Fitch (1851, p. 61).

Length 2.5–2.75 mm. Vertex longer than width between eyes, sharply angled. Female uniform yellowish, with milky white ner-

gus in lateral view, fig. 381B, broad at base, with a short dorsobasal process; notch at about the middle of caudal side producing a long narrowed attenuated process dorsad to notch.

Distributed through the eastern states and west to Colorado, this species occurs on dry uplands, pastures, and meadows in the *Danthonia* association, where it has been collected from *Danthonia spicata* and *compressa*.

**Illinois Records.**—Males and females, taken March 28 to October 3, are from Anvil Rock, Dixon Springs, Dolson, Elizabethtown, Gibsonia, Grand Detour, High Knob, Monticello, Muncie, Norris City, Ozark, Palos Park, and Starved Rock State Park.

### 4. *Laevicephalus unicoloratus* (Gillette & Baker)

*Deltoccephalus unicoloratus* Gillette & Baker (1895, p. 89).

*Deltoccephalus oculatus* Osborn & Ball (1897, p. 212). Preoccupied.

*Deltoccephalus nominatus* Sanders & DeLong (1920, p. 9). New name for *oculatus* O. & B.

Length 3.5 mm. Pale yellowish to greenish. Vertex a little longer than basal width between eyes. Ocelli, impressed line on vertex, and eyes dark; interocellar line from apex to ocelli pale brownish. Elytra subhyaline, nervures yellowish. Female seventh sternite, fig. 386G, with median third of posterior margin produced, dark margined, and scarcely trilobate. Male plates, fig. 379A, convex, narrowed to produced attenuated tips. Aedeagus, fig. 379B, long, narrowed, and slender on median third, broadened on apical third and bearing a ventral tooth about one-fourth the distance from apex.

This species is common on *Andropogon* in the east-central states and in Illinois in certain of the dark prairie and sand prairie habitats.

**Illinois Records.**—CAVE IN ROCK: Oct. 2, 1934, Frison & Ross, 1 ♀. DONGOLA: May 11, 1917, 1 ♀. EVERGREEN PARK: Aug. 23, 1934, DeLong & Ross, 31 ♂, 28 ♀; July 1, 1935, DeLong & Ross, 5 ♂, 6 ♀. HANOVER: June 29, 1935, DeLong & Ross, 1 ♀. OAK LAWN: in lamp globe, Aug. 23, 1934, 1 ♂, 1 ♀. ST. ANNE: July 20, 1934, DeLong & Ross, 3 ♂, 16 ♀; Aug. 21, 1934, DeLong & Ross, 3 ♀; Aug. 26, 1935, DeLong & Ross, 1 ♀. VIENNA: June 14, 1934, DeLong &

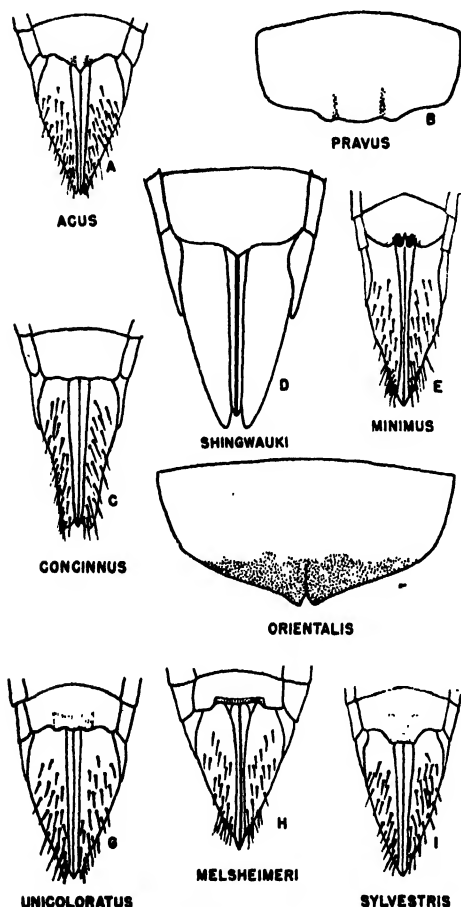


Fig. 386.—*Laevicephalus*. A–I, female genitalia.

vures. Male head, pronotum, and scutellum brighter yellow, a faint brown arc on either side of vertex extending from apex to black ocelli. Elytral nervures faintly bordered throughout with fuscous. Face pale brown.

Female seventh sternite, fig. 386H, with median half of posterior margin having a simple very shallow black-bordered excavation. Male plates, fig. 381A, broad at bases, only slightly narrowed to broadly rounded upturned tips appearing from below as almost truncate; a median brownish line expanding toward tip of each plate. Aede-

Ross, 1 ♀. ZION: July 16, 1935, DeLong & Ross, 1 ♂, 3 ♀; Aug. 7, 1935, DeLong & Ross, 1 ♀.

5. *Laevicephalus sylvestris* (Osborn & Ball)

*Deltocephalus sylvestris* Osborn & Ball (1897, p. 213).

Length 3.5 mm. Dull greenish, tinged with yellow. Vertex distinctly angled, about one-fourth longer than width between eyes. Ocelli and eyes dark; a rather heavy fuscous stripe on either side of apex extending obliquely onto disc, then broadening and continuing to pronotum. Elytra whitish or dull hyaline, nervures greenish yellow, often broadly margined with fuscous, especially on apical portions and along sutural line.

Female seventh sternite, fig. 386I, emarginate posteriorly on either side of an abruptly produced black truncated process that is almost one-third the length of the segment on the median third. Male plates, fig. 383A, with sides concavely narrowed to bluntly pointed divergent tips. Aedeagus long, in lateral view, fig. 383B, with basal third broadened and bearing a dorsal spine; apical two-thirds narrow and slightly enlarged at apex.

This distinctive species occurs with *mel-sheimerii* in the *Danthonia spicata* association and probably feeds on several of the grasses. It is a common and widely distributed species from the Great Lakes region to the Gulf Coast.

Illinois Records.—Many males and females, taken May 18 to November 4, are from Alton, Apple River Canyon State Park, Atlas, Barry, Cave in Rock, Dixon Springs, Dolson, Dubois, Eichorn, Fairfield, Fox Lake, Galena, Geff, Havana, Herod, Hope-dale, Jonesboro, Karnak, Mahomet, Marshall, Monticello, Mount Carmel, Muncie, New Milford, Newton, Olive Branch, Oregon, Ozark, Pike, Port Byron, St. Anne, Savanna, Seymour, Shawneetown, Temple Hill, Urbana, Vienna, Watson, White Pines Forest State Park, and Wilmington.

6. *Laevicephalus acus* (Sanders & DeLong)

*Deltocephalus acus* Sanders & DeLong (1920, p. 10).

Length 4 mm. Yellowish green, sharp headed. Vertex one-fifth longer at middle

than width between eyes; the median impressed line, ocelli, and arcuate line from apex toward eye pale brown. Elytra milky hyaline, veins paler, faintly bordered with fuscous. Face sordid yellow, with paler arcs.

Female seventh sternite, fig. 386A, with median half of posterior margin produced, forming a broad, pointed tooth with sinuate sides and margined with brown. Male plates, fig. 378A, concavely narrowed to bluntly pointed apices. Aedeagus in lateral view, fig. 378B, broad at base, with a very blunt dorsal spur; narrowed at one-third its length to a narrow apical portion that is slightly enlarged at apex.

This is a grass-feeding species that seems to be found more abundantly upon coarse grasses in swampy areas than elsewhere. It has not been taken on the prairies. It is northern in distribution, ranging from New York west to Wisconsin and Illinois.

Illinois Record.—WAUCONDA: July 23, 1934, DeLong & Ross, 1 ♀.

7. *Laevicephalus concinnus* (Sanders & DeLong)

*Deltocephalus concinnus* Sanders & DeLong (1917, p. 86).

Length 3 mm. Greenish, marked with longitudinal stripes. Vertex bluntly angled, as long as wide. Ocelli black; vertex, pronotum, and scutellum each with two broad parallel brownish stripes, and an additional stripe behind each eye on pronotum. Elytra with white nervures. Face dusky. Female seventh sternite, fig. 386C, slightly longer than preceding sternite, almost truncate, sinuate, and with median brown spot. The male is not known.

This species has been collected in tall grasses and sedges in marshes in Wisconsin and northern Illinois.

Illinois Records.—FOX LAKE: June 30, 1935, DeLong & Ross, 1 ♀; June 26, 1936, 4 ♀.

8. *Laevicephalus orientalis* DeLong & Davidson

*Laevicephalus orientalis* DeLong & Davidson (1935, p. 167).

Length 3.5–4.0 mm. Vertex as long as basal width between the eyes, creamy to bright yellow. Pronotum and scutellum greenish, washed with yellow. Elytra vary-

ing in color, sometimes dark green, with white or yellowish veins, often with apexes smoky.

Female seventh sternite, fig. 386*F*, without lateral angles, posterior margin produced, sloping to middle of segment, which is distinctly incised, leaving a pair of inconspicuous teeth at middle. Male plates, fig. 385*A*, broad at bases, strongly and convexly curved to rather blunt and broad apexes. Aedeagus in lateral view, fig. 385*B*, appearing broad, with a curved portion extending ventrally and posteriorly and produced by being curved upward; this structure open in the middle and appearing as two parallel pieces.

Distributed from Pennsylvania to Tennessee and Illinois, this species has been taken commonly in open woodland on *Elymus* grasses.

**Illinois Records.**—CAVE IN ROCK: May 7, 1932, H. L. Dozier, 1 ♀. DUBOIS: May 21, 1917, 1 ♂. EICHORN: Hicks Branch, June 13, 1934, DeLong & Ross, 6 ♀. ELIZABETHTOWN: May 27–31, 1932, Dozier, 1 ♀. HARDIN: June 5–9, 1932, Dozier, 1 ♀. MONTICELLO: June 11, 1934, Frison & DeLong, 1 ♂. SHAWNEETOWN: June 14, 1934, Ross & DeLong, 2 ♀.

### 9. *Laevicephalus pravus* DeLong

*Laevicephalus pravus* DeLong (1937*b*, p. 34).

Length 3.0–3.5 mm. Yellowish, resembling *unicoloratus* in general appearance. Vertex bluntly angled, a little wider between eyes than median length, bright yellow, unmarked. Ocelli and ovipositor black.

Female seventh sternite, fig. 386*B*, roundly produced, almost truncate. Male plates long, tapered to acute apexes. Aedeagus in lateral view, fig. 380*B*, narrowed at half its length and tapered to a long threadlike attenuated apex; in ventral view it appears broad at base, rapidly narrowed and produced, slightly enlarged just before apex, and with teeth on the outer margin; tip of aedeagus bluntly pointed.

This species was taken abundantly in a prairie habitat in northern Illinois, and from one other locality in the state. It is known only from Illinois.

**Illinois Records.**—DES PLAINES: Sept. 4, 1935, DeLong & Ross, 1 ♂; Sept. 18, 1935, DeLong & Ross, 15 ♂, 52 ♀. HANOVER: Aug. 22, 1936, 1 ♂.

### 59. *PSAMMOTETTIX* Haupt.

*Psammotettix* Haupt (1929, p. 262).

Fig. 236*B*. Closely related to *Laevicephalus*, this genus is distinguished chiefly by having the male plates, figs. 387, 388, shorter than the valve, and the female seventh sternite, fig. 236, is usually broadly and concavely rounded and relatively simple on the posterior margin.

Twelve species have been recorded in this genus for the United States under the *striatus* group of *Laevicephalus* (DeLong & Knull, 1945). Two species occur in Illinois.

#### KEY TO SPECIES

Male aedeagus, fig. 387, blunt and entire at apex; connective long, slender. . . . .1. *striatus*  
Male aedeagus, fig. 388, sharp pointed at apex and bifurcate one-third the length of aedeagus; connective short, horseshoe shaped. . . . .2. *ferratus*

#### 1. *Psammotettix striatus* (Linnaeus)

*Cicada striata* Linnaeus (1758, p. 437).

Length 3.5–4.0 mm. Greenish, markings variable in color. Vertex blunt and broadly angled, often with definite fuscous spots or blotches, interocellar line pale. Elytra variable, nervures frequently fuscous margined, and often so dark that elytra appear striped.

Female seventh sternite, fig. 236*B*, with posterior margin shallowly concave on median half. Male plates, fig. 387, short, apexes obliquely truncate and gently sloping to median line, the large round male valve almost obscuring the plates. Aedeagus connective twice as long as aedeagus, which is slender, curved dorsally, and bears a dorsally directed ventral process.

A transcontinental species, this is one of the most common of the grass leafhoppers and is found in greater abundance in pastures and meadows than in prairie habitats.

**Illinois Records.**—Many males and females, taken May 14 to October 1, are from Algonquin, Alton, Amboy, Antioch, Arlington Heights, Barry, Beach, Bradley, Bushnell, Champaign, Decatur, Des Plaines, Effingham, Elizabeth, Evergreen Park, Forest City, Fox Lake, Fulton, Galena, Grafton, Grand Detour, Grays Lake, Hanover, Hardin, Havana, Homer, Ingleside, Kankakee, Macomb, Marshall, Mason City, McHenry, Monmouth, Monticello, Mount

Sterling, Muncie, New Holland, New Milford, Normal, Oak Lawn, Ogden, Oquawka, Orangeville, Palos Park, Pankeyville, Parker, Port Byron, St. Anne, Savanna, Seymour, Shawneetown, Sheffield, Springfield, Summit, Texas City, Urbana, Volo, Watson, Wauconda, Waukegan, White Heath, White Pines Forest State Park, and Zion.

2. *Psammotettix ferratus* (DeLong & Davidson)

*Laevicephalus ferratus* DeLong & Davidson (1935, p. 170).

Length 3.5 mm. In size, form, and coloration this species resembles *striatus* so closely it cannot be separated by external markings or by external genital structures.

Female seventh sternite shallowly and concavely rounded as in *striatus*. Male plates, fig. 388, short and truncate. Connectives very short, in ventral view with a rounded horseshoe-shaped base; aedeagus short, angularly bent and directed upward, apex sharply pointed, appearing bifurcate in dorsal view.

This species occurs in various habitats and

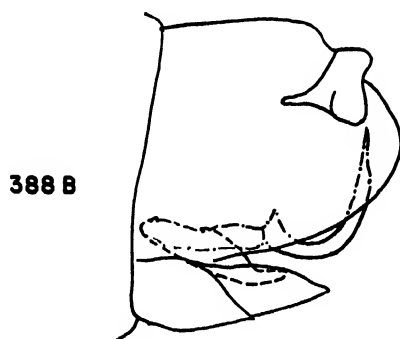
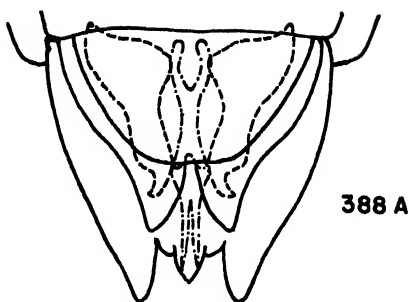


Fig. 388.—*Psammotettix ferratus*, male genitalia. A, ventral aspect; B, lateral aspect.

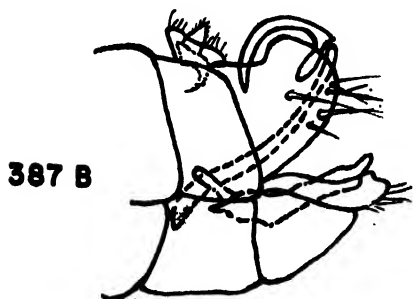
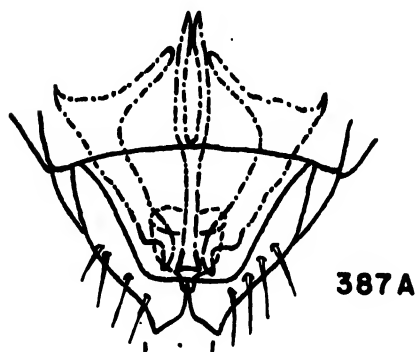


Fig. 387.—*Psammotettix striatus*, male genitalia. A, ventral aspect; B, lateral aspect.

has been taken along Lake Erie and in the Chicago area near Lake Michigan. It has also been recorded from Pennsylvania, but has been collected only in small numbers in these localities.

**Illinois Records.**—MACOMB: in pasture, July 3, 1934, DeLong & Ross, 1 ♂. ST. ANNE: July 20, 1934, DeLong & Ross, 1 ♂. VOLO: July 27, 1934, DeLong & Ross, 1 ♂, 2 ♀.

60. *AMPLICEPHALUS* DeLong

*Amplicephalus* DeLong (1926a, p. 83).

Fig. 208. Vertex transverse and broad, width between eyes greatly exceeding length at middle, strongly rounded or very broadly and bluntly angled with front. Elytra with central anteapical cell constricted and divided, and with one or two crossveins between first and second sectors. Form broad and robust.

KEY TO SPECIES

Tawny, with a row of four or six black spots just above margin of vertex. . . . . 1. *osborni*  
Green, with a transverse black band just back of yellow vertex margin. . . . . 2. *estacadus*

### 1. *Amplicephalus osborni* (Van Duzee)

*Deltoccephalus osborni* Van Duzee (1892c, p. 304).

Length 4.5–5.0 mm. Tawny yellow, with black markings. Vertex, fig. 389A, one-third broader than long, with four or six dark spots on anterior margin, the middle pair larger and prominent, the two next to each ocellus smaller, transverse, often wanting; in well-marked specimens there is usually a tawny interrupted transverse band between eyes, and an irregular spot at base on either side. Pronotum with traces of five pale longitudinal stripes. Elytral nervures white, often heavily margined with fuscous.

Female seventh sternite, fig. 389D, with posterior margin bisinuate, forming three

broadly rounded lobes, broadly margined with dark brown; lateral lobes prominent at sides. Male plates, fig. 389C, triangular, gradually narrowed to acute tips. Aedeagus in lateral view, fig. 389B, broad, apical portion inflated and narrowed to a bluntly pointed apex.

This is a fresh-water marsh species found especially in the northern states from Maine to Colorado.

**Illinois Records.**—Many males and females, taken May 8 to September 24, are from Amboy, Antioch, Beach, Clay City, Danville, Dubois, Fox Lake, Grand Detour, Havana, Oak Lawn, Oakwood, Port Byron, Princeton, Sun Lake, Volo, and Wauconda.

### 2. *Amplicephalus estacadus* (Ball)

*Athysanus estacadus* Ball (1911, p. 200).

Length 3.5 mm. Yellow to greenish, with black bands. Vertex, fig. 389A, wider than median length, with a yellow margin, just back of and parallel to which is a broad black band. Pronotum with a transverse median light band. Elytral nervures light. Female seventh sternite, fig. 389D, short, posterior margin slightly and broadly emarginate. Male plates, fig. 389C, triangular, broad at base, convexly rounding to near middle, then concave, gradually narrowing to acute tips. Aedeagus broad in ventral view, fig. 389B, and deeply bifid at apex; in lateral view it appears notched on dorsal surface near base and is tapered to a pointed apex.

This is a grass-feeding species found abundantly in pastures and meadows. It is southern in distribution and will probably be found in southern Illinois.

### 61. *ARUNDANUS* DeLong

*Arundanus* DeLong (1935b, p. 180).

Fig. 220. The genus is characterized by having the vertex produced and bluntly angled, flat, margin rather thick but distinct, not rounded to front. Venation of wing with central anteapical cell greatly elongated, constricted, and divided by a crossvein at center; outer anteapical cell usually elongated but narrow; inner anteapical cell short and rather broad.

As far as known, the 14 described species of this genus are largely confined to cane, *Arundinaria tecta*, an abundant host along stream margins or in low moist areas in the

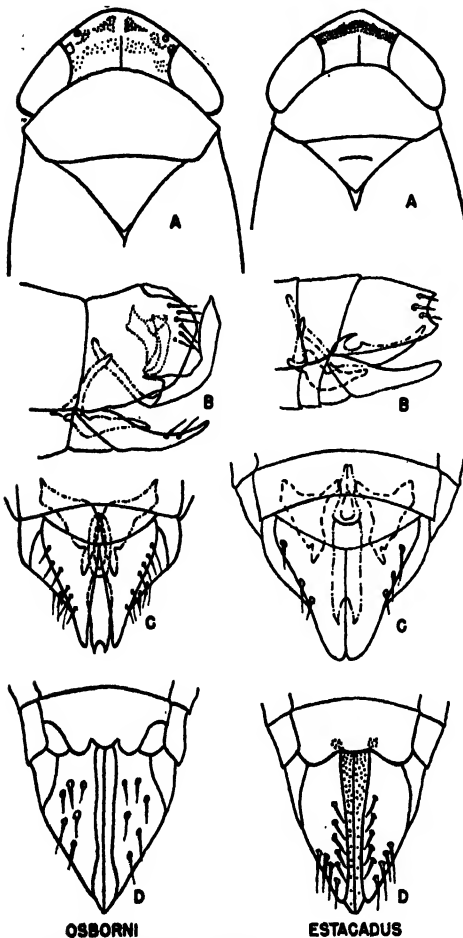


Fig. 389.—*Amplicephalus*. A, head and pronotum; B, male genitalia, lateral aspect; C, male genitalia, ventral aspect; D, female genitalia.

southeastern United States. In Illinois the cane occurs north of the Ohio River, extending to some extent over the southern fourth of the state. Records of four species have been obtained in Illinois, and several other species may occur here.

## KEY TO SPECIES

1. Yellow, orange, or brown, marked with black transverse lines or spots on margin of vertex..... 2  
Color white, yellow, orange, or some shade of brown, without black spots or lines on margin of vertex..... 5
2. Vertex with a black wavy line on margin or just below; margin not white, bordered with dark lines..... 3  
Vertex margin white or pale, bordered with black lines above and below..... 4
3. Vertex with a broad wavy line on margin, with four quadrate black spots above, fig. 390A..... 1. *crumbi*  
A heavy wavy line below vertex margin, an interrupted black band above, composed of three narrowly connected triangular spots on either side, fig. 390B..... 2. *proprius*
4. Vertex with a broken line composed of four irregular triangular spots above margin, fig. 390E. Female seventh sternite, fig. 390I, deeply and roundedly excavated at middle. Male aedeagus, figs. 390N, 390O, terminating in sharply pointed processes..... 3. *arundineus*  
Vertex with a wavy line above the white margin, fig. 390C. Female seventh sternite, fig. 390J, appearing trilobate. Male aedeagus, figs. 390P, 390Q, rounded, blunt at apex, dorsal process broad, serrate on truncate tip..... 4. *marginellus*
5. Dorsum uniform in color, deep orange in male, white in female.... 5. *nacreosus*  
Dorsum not uniform in color; vertex orange yellow, margin paler; elytra smoky yellow, nervures pale..... 6. *flavotinctus*

1. *Arundanus crumbi* (DeLong)

*Thamnotettix crumbi* DeLong (1916, p. 81).

Length 5.0–5.5 mm. Orange yellow, with a rather broad wavy line on anterior margin of vertex, fig. 390A, and four quadrate spots just above black, the central pair larger; vertex one-fourth longer at middle than next to eyes. Elytra yellowish, nervures orange yellow, wings smoky. Female seventh sternite, fig. 390K, broadly and angularly excavated, lateral angles produced and prominent. Male plates elongate, longer than combined basal width, gradually tapered from bases to blunt apices. Aedeagus, figs. 390R, 390S, with a long tapering ventral process

that is curved dorsally and anteriorly at apex, also a broad dorsal process, blunt at apex, extending dorsally from base of aedeagus body and curved anteriorly.

Common on *Arundinaria tecta* in Tennessee, *crumbi* should occur in southern Illinois.

2. *Arundanus proprius* (DeLong)

*Thamnotettix proprius* DeLong (1918b, p. 238).

Length of male 4.5 mm. Resembling *shermani* Ball (1903, p. 230), in coloration but with a more strongly produced and angled vertex, fig. 390B. Vertex a little wider between eyes at base than median length; margin pale, bordered beneath by a uniform black band and above by a band composed of three large triangular spots on each side, the central pair of spots largest and decidedly separated. Male plates, fig. 390M, long and narrow, bluntly pointed. Aedeagus in lateral view, fig. 390L, curved dorsally at apex and enlarged into a half spearhead, the enlarged portion on the caudal margin. Style with a short outwardly curved apical process.

This species is known to occur in Tennessee only.

3. *Arundanus arundineus* (DeLong)

*Thamnotettix arundineus* DeLong (1926b, p. 91).

Length 4.5–5.0 mm. Smoky brown, tinged with orange. Vertex, fig. 390E, bluntly angled, almost one-fourth wider between eyes than length at middle; margin pale, bordered with brown below and with a broken brownish line above, the latter composed of four irregular triangular spots; two broad orange longitudinal bands arise near margin of vertex and extend across pronotum to basal angles of scutellum. Elytra smoky subhyaline, veins whitish.

Female seventh sternite, fig. 390I, produced on either side to form a pair of broadly rounded lobes, between which the posterior margin is broadly and roundedly excavated more than half way to the base. Male valve, fig. 390O, broad, triangular, plates long and narrow, almost three times as long as valve and gradually tapering to rather sharp apices. Ventral process of aedeagus, fig. 390N, with an enlarged blunt rounded apex; dorsal portion slightly enlarged at apex, truncate and with a serrate margin.



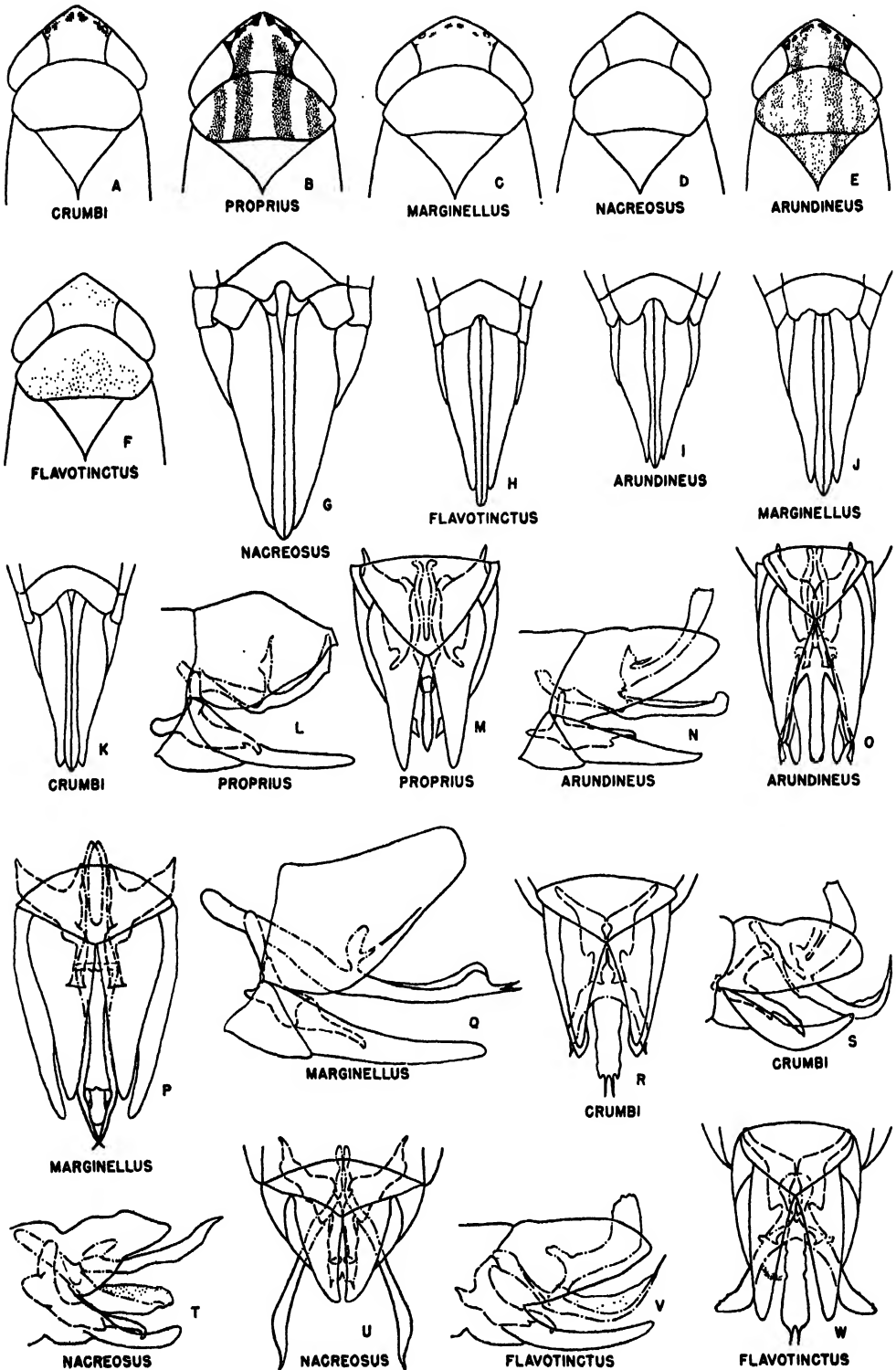


Fig. 390.—*Arundanus*. A-F, head and pronotum; G-K, female genitalia; L-W, male genitalia.

A common species on cane, *Arundinaria tecta*, *arundineus* occurs in southern Illinois and Tennessee.

Illinois Record.—VIENNA: June 14, 1934, DeLong & Ross, 12 ♂, 10 ♀.

#### 4. *Arundanus marginellus* DeLong

*Arundanus marginellus* DeLong (1935b, p. 181).

Length 5.0–5.5 mm. Tawny to grayish, tinged with orange. Vertex, fig. 390C, flat, bluntly angled, a little more than half as long at middle as width between eyes; margin of vertex conspicuously white, bordered above by brownish wavy line and below by a fainter line. Pronotum marked with four conspicuous longitudinal orange stripes. Elytra with pale veins.

Female seventh sternite, fig. 390J, long, with prominent lateral angles, posterior margin indented on either side of a broad median rounded tooth, which is produced as far as the lateral angles and is bifid at apex. Male valve, fig. 390P, broad, obtusely angled; plates long, gradually tapering to narrow acute tips. Ventral portion of aedeagus, fig. 390Q, broad, elongate, slightly enlarged just before apex, then terminating in a pair of long spinelike structures; dorsal portion composed of a long slender tapered spine.

A common species on cane, *Arundinaria tecta*, *marginellus* occurs in Illinois and Tennessee.

Illinois Records.—HEROD: July 6–11, 1935, DeLong & Ross, 3 ♂, 1 ♀. KARNAK: Aug. 8, 1934, 1 ♀. THEBES: July 11, 1935, DeLong & Ross, 6 ♂, 13 ♀. VIENNA: savanna grasses, June 14, 1934, DeLong & Ross, 30 ♂, 16 ♀; July 10, 1935, DeLong & Ross, 4 ♂, 7 ♀.

#### 5. *Arundanus nacreosus* (Crumb)

*Chlorotettix nacreosus* Crumb (1915, p. 196).

Length 5.0–5.5 mm. With distinct sexual dimorphic coloration. Male deep orange, female uniformly white. Vertex, fig. 390D, obtusely angulate, one-half longer at middle than next to eye. Female seventh sternite, fig. 390G, twice as broad as long, with posterior margin excavated half way to base by a broad triangular notch, which is interrupted on either side of middle by a pair of rounded lobes, presenting the appearance

of three distinct notches. Male valve, fig. 390U, convex anteriorly, rounded posteriorly, two and one-half times as broad as long; plates longer than broad, tips rounding. Aedeagus, fig. 390T, with a short broad blunt ventral portion and a pair of long slender bladelike structures comprising the dorsal portion.

Very abundant on cane, *Arundinaria tecta*, this species occurs in the Mississippi and Ohio river valleys in southern Illinois.

Illinois Records.—ELIZABETHTOWN: June 25, 1932, Ross, Dozier, & Park, 1 ♂. HEROD: Aug. 4, 1934, DeLong & Mohr, 1 ♀; June 24, 1936, DeLong & Ross, 5 ♂, 2 ♀. KARNAK: Aug. 8, 1934, DeLong & Mohr, 1 ♂, 1 ♀. VIENNA: June 14, 1934, DeLong & Ross, 54 ♂, 1 ♀; July 29, 1934, DeLong & Ross, 16 ♂, 21 ♀.

#### 6. *Arundanus flavotinctus* (DeLong)

*Thamnotettix flavotinctus* DeLong (1916, p. 82).

Length 5.5 mm. Yellowish, tinged with orange, margin paler than adjacent areas. Elytra smoky yellow, nervures pale. Vertex, fig. 390F, flat, a little wider between eyes at base than median length. Female seventh sternite, fig. 390H, with posterior margin broadly and angularly excavated half way to the base, bottom of excavation brownish. Male valve, fig. 390W, almost truncated, fitting in the concavity of the seventh sternite; plates rather short and broad, a spot near outer margin at base of each. Ventral portion of aedeagus, fig. 390V, long, gradually narrowed to acutely pointed upturned apex; dorsal portion broad, enlarged, and curved dorsally before blunt apex.

Common on cane, *Arundinaria tecta*, this species is found in the Mississippi River valley.

Illinois Record.—VIENNA: July 10, 1935, DeLong & Ross, 2 ♀.

#### 62. *GRAMINELLA* DeLong

*Graminella* DeLong (1936a, p. 218).

Individuals of this genus usually have a produced and bluntly angled vertex with a thin margin, angled with front. Venation simple, central anteapical cell long and constricted at middle; outer anteapical cell comparatively short.

Individuals of the 14 known species of

the genus are comparatively small in size, 3.5–4.5 mm., and so far as is known are all grass feeders. They are common in the fresh- and salt-water marshes of the eastern United States, occurring especially upon the grasses of the *Spartina* association. Six species have been taken in Illinois; some of them occur on the wet and dry prairies.

#### KEY TO SPECIES

1. Vertex, pronotum, and scutellum with broad longitudinal red stripes, fig. 391C  
..... **1. aureovittata**  
Without red longitudinal lines on vertex, pronotum, and scutellum..... 2
2. Vertex marked with four marginal spots..... 3  
Vertex without black spots, sometimes with faint brownish markings..... 5
3. Row of black spots on vertex continuing through ocelli along anterior margins of eyes to antennae..... **2. nigrifrons**  
Row of black spots not continuing below the vertex margin; ocelli often pale, inconspicuous..... 4
4. Length 4.5 mm. Spots on vertex large, conspicuous; female seventh sternite, fig. 391E3, with broad median sunken tooth; male plates, figs. 391E6, 391E7, one-half longer than combined basal width, apices pointed..... **3. fitchii**  
Length not exceeding 4.0 mm. Paler in color; ocelli black, spots on vertex often faintly marked; female seventh sternite, fig. 391D3, concavely rounded, without tooth; male plates, fig. 391D6, as long as combined basal width..... **4. pallidula**
5. Female seventh sternite, fig. 391B3, with prominent sunken tooth; apical portion of male aedeagus, figs. 391B4, 391B5, concavely emarginate on ventral side before apex, and with a large black tooth on upper apical portion..... **5. mohri**  
Female seventh sternite, fig. 391A3, concavely rounded, without tooth; male aedeagus, figs. 391A4, 391A5, concave on dorsal surface, a small black tooth on ventral median portion..... **6. oquaka**

#### 1. *Graminella aureovittata* (Sanders & DeLong)

*Thamnotettix aureovittatus* Sanders & DeLong (1920, p. 16).

Length 4 mm. Yellowish or pale brown, ocelli black, a pair of small black triangular spots at apex of vertex; two broad bright red longitudinal bands extend across vertex, pronotum, and scutellum. Elytra brownish, with pale veins. Vertex, fig. 391C1, broadly rounded, one-fourth wider between eyes

than median length and only slightly produced before outer margins of eyes.

Female seventh sternite, fig. 391C3, rather deeply and roundedly excavated on median half of posterior margin, brown bordered; underlying sternite shows conspicuously at lateral edges of seventh sternite. Male plates, fig. 391C6, short and broad, rounded. Aedeagus, figs. 391C4, 391C5, in ventral view broadened at apex and narrowly notched; in lateral view tapered to a pointed apex. Style as in fig. 391C2.

This species occurs abundantly on the wet prairies in the Chicago area. It is recorded from Florida, Massachusetts, and Illinois.

**Illinois Records.**—OAK LAWN: in lamp globe, Aug. 22, 1934, 14 ♂, 10 ♀; Aug. 23, 1934, Frison & Ross, 1 ♂; sand prairie, Aug. 27, 1934, 1 ♀; Sept. 6, 1935, T. H. Frison, 1 ♂. ST. ANNE: July 20, 1934, DeLong & Ross, 1 ♀. SUMMIT: July 17, 1935, DeLong & Ross, 1 ♂, 3 ♀; Aug. 21, 1935, DeLong & Ross, 1 ♂, 1 ♀.

#### 2. *Graminella nigrifrons* (Forbes)

*Cicadula nigrifrons* Forbes (1885, p. 67).

*Thamnotettix perpunctata* Van Duzee (1894b, pp. 200, 212).

Length 2.5–4.0 mm. Yellowish green, marked with black spots. Vertex bluntly angled, one-third wider between eyes than median length, with a row of black spots on anterior margin extending down on to front next to eyes. Face almost black and marked with irregular yellow spots. Elytra with pale nervures, these often bordered with fuscous.

Female seventh sternite emarginate posteriorly. Male plates short, broad at base, and narrowed to acute apices. Aedeagus rather rapidly narrowed on basal third to a long slender dorsally curved apical portion, the apex of which is blunt and bent anteriorly.

This is one of the most abundant and common of the grass-feeding species of leafhoppers in the eastern half of the United States. It can be found upon almost every lawn, pasture, and meadow and upon almost every cultivated crop.

**Illinois Records.**—Many males and females, taken May 11 to November 13, are from Albion, Algonquin, Alton, Anvil Rock,

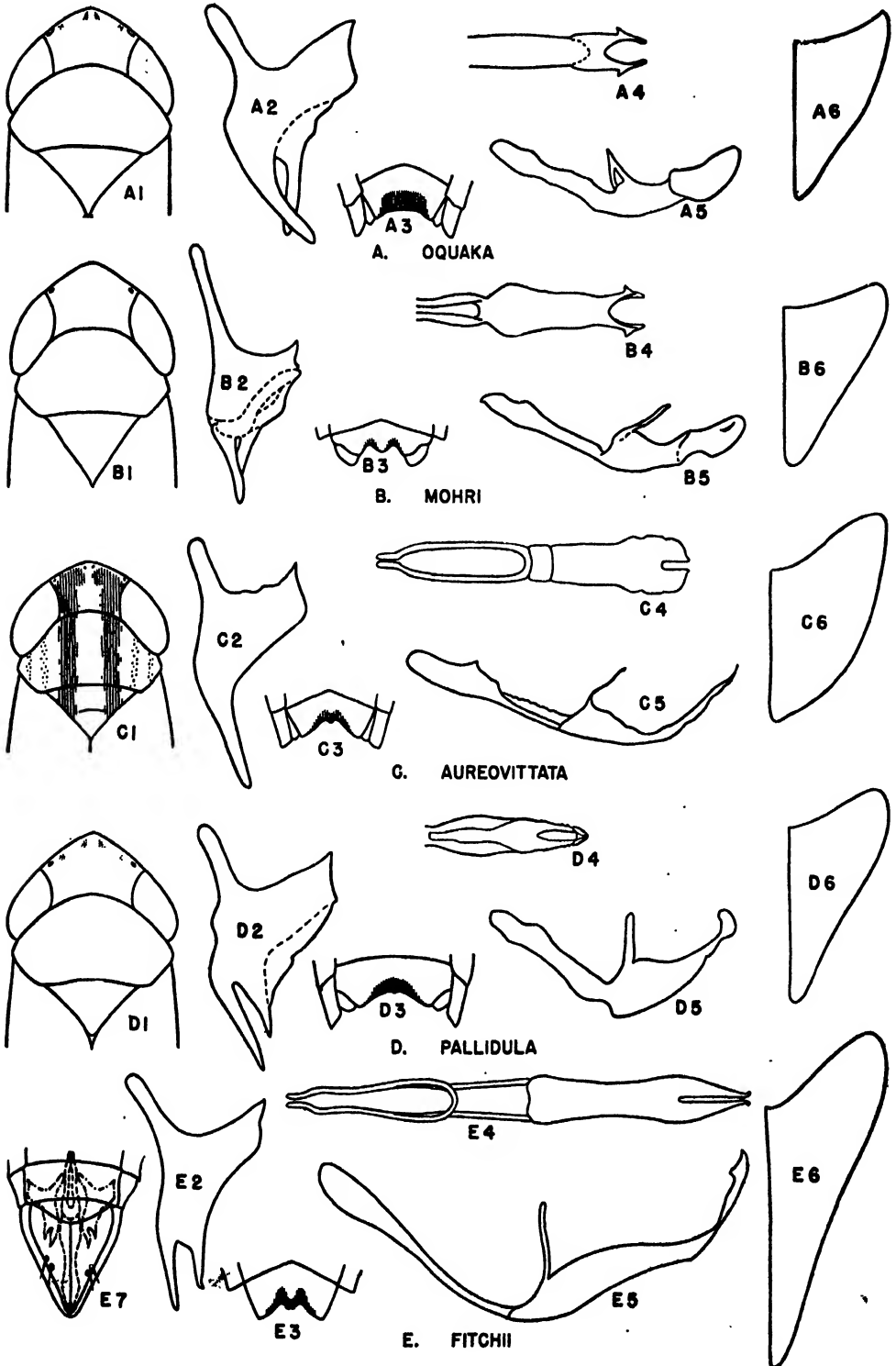


Fig. 391.—*Graminella*. 1, head and pronotum; 2, style; 3, female seventh sternite; 4, ventral view of aedeagus; 5, lateral view of aedeagus; 6, male plate; 7, ventral view of male genitalia.

Anna, Apple River Canyon State Park, Barry, Bushnell, Cache, Cairo, Carbondale, Cave in Rock, Champaign, Cobden, Collinsville, Danville, Decatur, Detroit, Dixon Springs, Dolson, Dongola, Du Quoin, East Cape Girardeau, Eichorn, Elizabethtown, Evergreen Park, Fulton, Geff, Giant City, Gibsonia, Golconda, Grafton, Gulfport, Harrisburg, Havana, Herod, High Knob, Hillsboro, Horseshoe Lake, Kampsville, Kankakee, Karnak, Lawrenceville, Lincoln, Luther, Marshall, McHenry, Meredosia, Metropolis, Mokena, Momence, Mount Carmel, Muncie, Norris City, Oak Lawn, Oakwood, Ogden, Olive Branch, Oquawka, Pike, Port Byron, Princeton, Pulaski, Putnam, Quincy, St. Anne, St. Joseph, Seymour, Shawneetown, Sparta, Sugar Grove, Temple Hill, Thomson, Urbana, Ursa, Vandalia, Vienna, Villa Ridge, Volo, Warsaw, Watson, West Union, White Pines Forest State Park, Wolf Lake, and Zion.

### 3. *Graminella fitchii* (Van Duzee)

*Thamnotettix fitchii* Van Duzee (1890a, p. 133).

Length 4.5 mm. Yellowish green, with four black spots above margin of vertex, a round one next to each ocellus and a pair of triangular spots just back of apex; vertex bluntly angled, slightly wider between eyes than median length. Elytra with pale veins.

Female seventh sternite, fig. 391E3, roundedly excavated on either side of a median slightly produced broad sunken tooth; black markings of posterior margin causing it to appear more deeply notched. Male plates, figs. 391E6, 391E7, long, gradually and concavely tapered to bluntly pointed apices; valve with a pair of processes at apex. Aedeagus in ventral view, fig. 391E4, broad, slightly constricted at middle, enlarged on apical third, then tapered to a pair of laterally directed pointed apical processes that are formed by a deep narrow median incision; in lateral view, aedeagus, fig. 391E5, broad at base, narrowed near apex, then apparently enlarged by the curling of the apex. Style as in fig. 391E2.

This is the most common species of the genus and has been found throughout Illinois. Distributed through the eastern states and west to Kansas, it occurs in abundance in fresh-water marshes and swamps, on

rank growths of grasses, and on the moist prairies.

**Illinois Records.**—Many males and females, taken May 20 to October 5, are from Algonquin, Alton, Antioch, Apple River Canyon State Park, Beach, Detroit, Dixon Springs, Dolson, Dongola, Elgin, Fern Cliff, Fountain Bluff, Fox Lake, Fulton, Geff, Grafton, Grand Detour, Gulfport, Hamilton, Hanover, Havana, Herod, Homer, Karnak, Keithsburg, Momence, Monticello, Muncie, Newton, Norris, Oak Lawn, Olive Branch, Oquawka, Princeton, Putnam, Quincy, Rock Island, Sheffield, Spring Valley, Starved Rock State Park, Sugar Grove, Summit, Sumner, Temple Hill, Urbana, Vienna, Volo, Waltersburg, White Heath, Wilmington, and Zion.

### 4. *Graminella pallidula* (Osborn)

*Thamnotettix pallidulus* Osborn (1898, p. 245).

Length 4 mm. Pale yellow, with six black spots on or above margin of vertex, middle pair sometimes obsolete, the outer pair on margin anterior to eyes. Vertex, fig. 391D1, bluntly and roundedly angled, one and one-half times as wide between eyes at base as length at middle. Elytra pale brown or tawny, nervures paler.

Female seventh sternite, fig. 391D3, with posterior margin broadly and deeply excavated, bearing an obtuse tooth at its apex. Male plates, fig. 391D6, convexly narrowed to acute apices. Styles, fig. 391D2, broad, with two anterior processes, which are directed outwardly. Aedeagus in ventral view, fig. 391D4, tapered to bluntly rounded apex; in lateral view, fig. 391D5, broad at base, tapered to a very narrow neck just before a rounded bulbous apex.

This species occurs on prairie grasses and is known only from Illinois and Iowa.

**Illinois Records.**—EVERGREEN PARK: Aug. 23, 1934, DeLong & Ross, 1♀. HAVANA: Aug. 8, 1934, Frison & Mohr, 1♀.

### 5. *Graminella mohri* DeLong

*Graminella mohri* DeLong (1937c, p. 50).

Length 4 mm. Yellowish, unmarked. Vertex, fig. 391B1, bluntly angled, about one-third wider between eyes than length at middle. Female seventh sternite, fig. 391B3, shallowly, roundedly excavated on

either side of a broad rounded median tooth; central half of segment brownish. Male plates, fig. 391B6, short and broad, gradually narrowed to blunt apices. Styles, fig. 391B2, rather narrow, each with a long basal process. Aedeagus in ventral view, fig. 391B4, broad at base, slightly tapered to apical third, then enlarged; apex bearing a broad deep V-shaped notch, on either side of which is a blunt pointed apical process that is abruptly set off from body of aedeagus at base; in lateral view, the apical portion of aedeagus, fig. 391B5, constricted at base on ventral side, then enlarged; apex broadly rounded, a large black spine on anterior apical margin.

This is a common species of the sand prairies and is common along the Great Lakes and in the upper Mississippi River valley. It is recorded from Pennsylvania, Illinois, and Kansas.

**Illinois Records.**—Many males and females, taken June 26 to August 22, are from Alton, Beach, Fulton, Hanover, Mahomet, Thomson, Waukegan, and Zion.

#### 6. *Graminella oquaka* DeLong

*Graminella oquaka* DeLong (1937c, p. 51).

Length 4 mm. Pale yellow, with black ocelli and indications of four very pale spots on margin of vertex; vertex, fig. 391A1, bluntly angled, about one-third wider between eyes than length at middle.

Female seventh sternite, fig. 391A3, with central half of posterior margin broadly and roundedly excavated about one-fourth the distance to base, at the apex of which is a slightly produced broad median tooth. Male plates, fig. 391A6, rather short, broad at bases, gradually narrowed to acute apices. Each style, fig. 391A2, broad, the apical process long, curved outwardly. Aedeagus in ventral view, fig. 391A4, rather broad, slightly broader on apical third; apex broadly, deeply excavated by a U-shaped notch forming two narrow pointed apical processes that are broadened toward base and abruptly set off from body of aedeagus; in lateral view, fig. 391A5, the apical third is broadened, rounded on ventral surface; apex bluntly rounded, a black tooth on median ventral portion.

Known from Illinois, this species occurs on bunch grass on the sand prairies of the upper Mississippi River valley.

**Illinois Records.**—HANOVER: Aug. 22, 1935, DeLong & Ross, 1 ♂. OQUAWKA: July 3, 1934, DeLong & Ross, 8 ♂, 7 ♀. THOMSON: June 30, 1935, DeLong & Ross, 3 ♂, 1 ♀. ZION: July 25, 1934, Frison & DeLong, 6 ♀.

#### 63. *AMBLYSELLUS* Sleesman

*Amblysellus* Sleesman (1930, p. 131).

Vertex produced, almost right angled, wider between eyes than length at middle. Front broad at apex, triangular, clypeus long. Elytra short and broad. Pronotum with a shiny band on front half.

Only one species has been placed in this genus.

##### 1. *Amblysellus curtisii* (Fitch)

*Amblycephalus curtisii* Fitch (1851, p. 61).  
*Jassus nervatus* Provancher (1872, p. 378).

Length 3.5 mm. Small, greenish yellow, with black markings. Vertex, fig. 397A, sharply angled, as long as width between eyes; a pair of small black spots on apex, a pair of large shiny black spots between these and a little in front of eyes. Anterior portion of pronotum produced between the eyes, shiny black, posterior portion greenish yellow, narrowly margined with fuscous posteriorly. Elytra brown, the margins and nervures greenish yellow.

Female seventh sternite, fig. 397B, with lateral margins arising near base and produced to posterior margin, which is slightly excavated on either side of a short rounded median lobe; lobes of underlying membrane visible at either side. Male plates, fig. 398A, as long as combined basal width, gradually narrowed to acutely pointed apices. Aedeagus as in fig. 398B.

This is a common species in bluegrass meadows and pastures, also on small grains and legumes in Illinois. It occurs in the northeastern states, Tennessee, and in many parts of the Middle West.

**Illinois Records.**—Many males and females, taken June 2 to November 29, are from Algonquin, Antioch, Apple River Canyon State Park, Bloomington, Carbondale, Champaign, Dolson, Fox Lake, Galena, Ingleside, Kankakee, New Milford, Oakwood, Pecatonica, Rock Island, Rockton, Urbana, White Heath, White Pines Forest State Park, and Wilmington.

64. *UNOKA* Lawson

*Unoka* Lawson (1928, p. 456).

Fig. 225. Related to *Driotura*, but with vertex more angularly produced, almost as long as basal width, and with sloping vertex more broadly rounded to front. The pronotum is slightly longer than vertex. The brachypterous elytra extend to the pygofers, and the macropterous wings extend beyond the tip of the abdomen, forming three ante-apical cells, which are distinct in both forms of elytra; apical cells absent in brachypterous form.

Only one species, *ornata*, is known in this genus, and it has not been recorded for Illinois. However, several species of leafhoppers with western distribution similar to *ornata* have been taken on the sand prairies in Illinois along the Mississippi River, and it may be collected at some future time in the western portion of the state.

1. *Unoka ornata* (Gillette)

*Athysanus ornatus* Gillette (1898a, p. 29).

Length 2-3 mm. Vertex bluntly angled, wider between eyes than median length, and broadly rounded with front. Pronotum two and one-half times as wide as long and slightly longer than vertex. Elytra reaching to pygofers in brachypterous form and produced beyond abdomen in macropterous form. Face, vertex, pronotum, and scutellum black. Posterior two-thirds of pronotum and apex of scutellum yellow. Elytra milky white, with three black transverse bands: a narrow basal one, a wider median one, and a wide apical one; in brachypterous specimens the apical black band covers the apexes of the elytra; in macropterous specimens, fig. 225, there is white coloration beyond the apical black band.

Female seventh sternite with posterior border broadly emarginate, emargination with two small rounded median teeth. Male valve long, angled at apex; plates elongate, triangular, exceeding pygofers, slightly and concavely rounded to acute tips.

This species occurs in Kansas and Nebraska on short grasses.

65. *UNERUS* DeLong

*Unerus* DeLong (1936a, p. 219).

Closely related to *Deltocephalus*. The general appearance is deltocephaloïd but it

differs from the species of *Deltocephalus* by having only one crossvein between the two sectors instead of two crossveins. The vertex is bluntly angled and rounded to front, without a prominent margin. The genitalia are similar to those of *Deltocephalus*. A single species, *colonus*, is recognized for this genus.

1. *Unerus colonus* (Uhler)

*Deltocephalus colonus* Uhler (1895, p. 80).  
*Deltocephalus comatus* Ball (1900c, p. 343).  
*Athysanus villicus* Crumb (1915, p. 194).

Length 2.5-3.0 mm. Yellowish, with two large round black spots on anterior margin of the vertex and two dark points at apex. Vertex as long as basal width. Front yellow, tinged with orange. Pronotum yellow; a transverse band on the anterior margin and a broad one on the posterior margin orange. Elytra yellowish hyaline. Abdomen orange above, venter pale. Female seventh sternite emarginate posteriorly, emargination with a small median tooth. Male plates gradually narrowed to acute tips.

This is a common meadow and pasture species in the eastern United States.

Illinois Records.—CAVE IN ROCK: Oct. 2, 1934, Frison & Ross, 6♂, 7♀; July 9, 1935, Ross & DeLong, 1♂, 1♀. DIXON SPRINGS: July 29, 1934, DeLong & Mohr, 1♀. EICHORN: June 13, 1934, DeLong & Ross, 2♀. GOLCONDA: Sept. 4, 1924, T. H. Frison, 1♀. VIENNA: on grass, June 14, 1934, DeLong & Ross, 4♂, 1♀; Aug. 3, 1934, DeLong & Mohr, 14♂, 4♀.

66. *GILLETTIELLA* Osborn

*Gillettiella* Osborn (1930, p. 689).

Figs. 210, 233A. This genus is characterized by a head that appears conical; elytra short, and ovipositor long in the female.

Three species are at present placed in this genus, none of which has been collected in or recorded for Illinois. However, since they occur in states just west of Illinois, at least one species may be found in the short grass areas of the state.

1. *Gillettiella atropuncta* (Gillette)

*Deltocephalus atropunctus* Gillette (1898a, p. 28).

Length of male 2 mm.; female 4 mm. Small, with a produced vertex that bears

a black spot at apex. Vertex sharply produced, margins rounded to front, about twice as long at middle as basal width between eyes. Color dull gray, with a black spot at apex of vertex. Pronotum with a transverse row of dark spots anteriorly.

Female seventh sternite with the posterior margin rounded to small lateral processes, margin slightly excavated between lateral processes on either side of a broad rounded middle portion, which is produced the length of lateral processes. Male pygofer with apexes broadly rounded. Valve as long as preceding segment, apex sharply angled. Plates broad at bases, inner margins contiguous, outer margins rounded to sharp apices medially. Each style narrowed on outer third; aedeagus long and slender, in lateral view bent dorsally into a semicircle.

This species has been recorded from Kansas, Nebraska, Colorado, and Texas.

## 67. *STIRELLUS* Osborn & Ball

*Stirellus* Osborn & Ball (1902, p. 250).

Vertex conically produced, narrow, longer at middle than width between eyes, disc convex, sloping, and merging with front. Elytra short and broad, venation simple. Ovipositor exceeding pygofer.

Thomas (1933) and subsequent authors recorded seven species and two varieties of *Stirellus* for the United States, and two of these occur in Illinois.

### KEY TO SPECIES

Vertex, fig. 395*A*, greenish, with apex broadly black; elytra greenish yellow, striped with black.....1. *bicolor*  
Vertex, fig. 396*A*, brown, with four spots arranged in two pairs, one pair posterior to the others, the anterior pair larger and sometimes confluent; elytra brownish, not striped.....2. *obtus*

### 1. *Stirellus bicolor* (Van Duzee)

*Athysanus bicolor* Van Duzee (1892*b*, p. 114).  
*Deltocephalus virgulatus* Uhler (1895, p. 78).

Length 3.0–3.5 mm. Small, color quite variable, usually greenish yellow, marked with black. Vertex, fig. 395*A*, acutely and conically pointed, as long at middle as width between eyes. Vertex with a pair of black spots before middle, often confluent and covering anterior half. Pronotum with a dark band on anterior portion, often extending across base of elytra. Elytra each with

claval suture, margins of suture, and apical margin dark fuscous, in male often entirely fuscous; nervures indistinct. Female seventh sternite, fig. 395*B*, with posterior margin broadly and shallowly concave. Male plates, fig. 400, short, narrowed to broad blunt apices, which are about half as wide as bases.

This is a common meadow species throughout the state and is frequently found upon clover, alfalfa, and other crops. It is widely distributed in the eastern and middle western parts of the United States.

**Illinois Records.**—Many males and females, taken June 14 to October 2, are from Albion, Alton, Alto Pass, Anna, Brownfield, Carbondale, Cave in Rock, Cobden, Dixon Springs, Dongola, Dubois, Elizabethtown, Fern Cliff, Fountain Bluff, Gibsonia, Grafton, Grand Tower, Harrisburg, Havana, Herod, Jonesboro, Karnak, Luther, Makanda, Marshall, Metropolis, Oakwood, Odin, Shawneetown, Temple Hill, Thebes, Urbana, Vienna, and Wolf Lake.

### 2. *Stirellus obtus* (Van Duzee)

*Athysanus obtus* Van Duzee (1892*b*, p. 115).

Length 3.0–3.5 mm. Brownish, with four spots on disc of vertex. Vertex, fig. 396*A*, as long at middle as basal width between eyes, with four spots between eyes, the anterior pair darker and usually larger than the posterior pair. Pronotum with a row of brownish spots on anterior margin often confluent. Elytra brownish subhyaline, nervures pale. Female seventh sternite, fig. 396*B*, with posterior margin broadly, shallowly excavated. Male plates, fig. 399, convexly rounded to broad blunt apices, which are about half as wide as basal width.

Although southern in distribution, this is a common species upon grasses in most parts of Illinois. It is abundant in meadows and pastures and upon cultivated crops of many types.

**Illinois Records.**—Many males and females, taken April 16 to December 4, are from Anvil Rock, Carbondale, Carmi, Cave in Rock, Centralia, Clay City, Cobden, Dixon Springs, Dolson, Dongola, Dubois, East Cape Girardeau, Elizabeth, Fern Cliff, Gibsonia, Golconda, Hardin, Heathsville, Herod, Karbers Ridge, Marshall, Mounds, Murphysboro, Norris City, St. Anne, Shawneetown, Urbana, Vienna, Watson, and Wolf Lake.



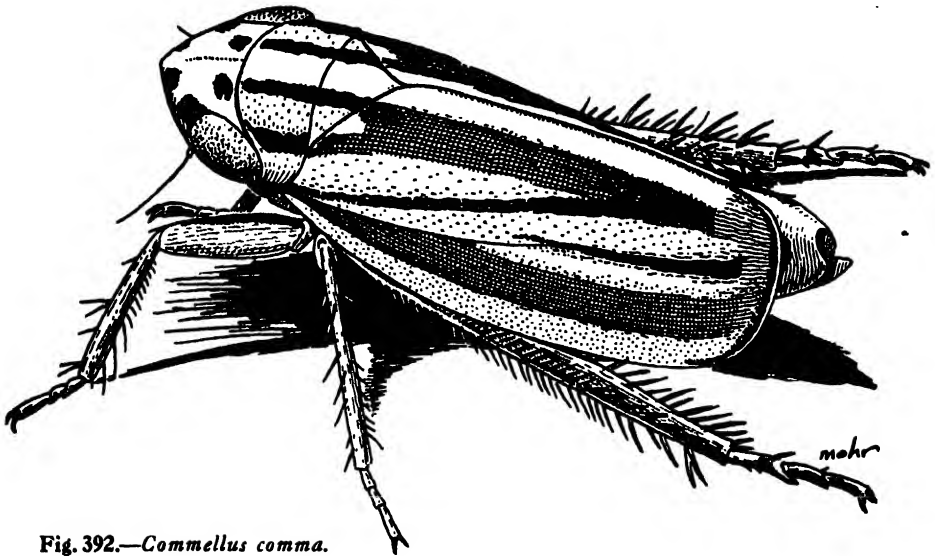


Fig. 392.—*Commellus comma*.

68. *COMMELLUS* Osborn & Ball

*Commellus* Osborn & Ball (1902, p. 245).

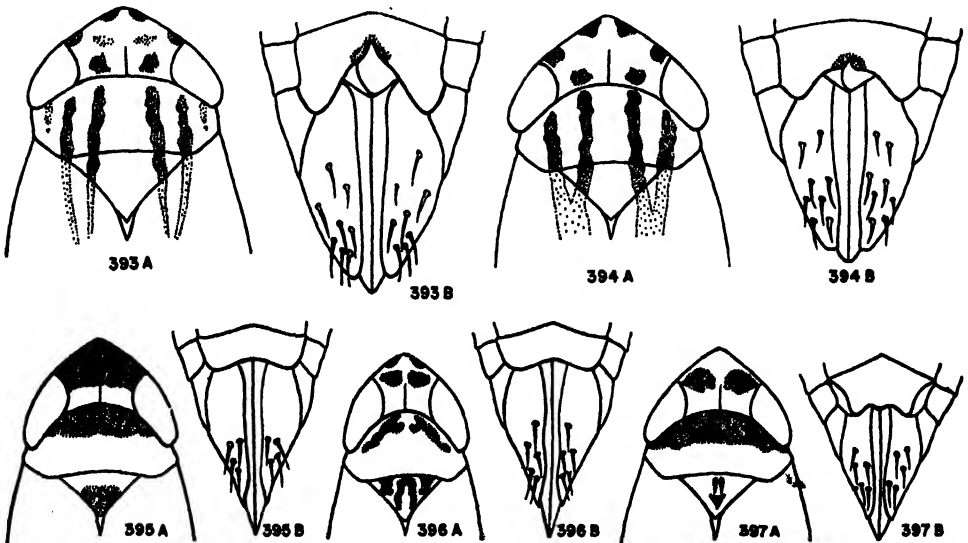
Fig. 392. Form broad and stout. Vertex flattened above, produced in front of eyes, acutely angled with front. Elytra of two forms shorter or decidedly longer than abdomen. Second cross nervure often present.

Four species have been placed in this

genus, and all are prairie forms. Two of them have been found in Illinois.

KEY TO SPECIES

Elytra marked with four distinct, separate stripes; two stripes on pronotum, fig. 394*A*, fused to form stripe on clavus . . . 1. *comma*  
Elytra marked with eight distinct and separate stripes; two stripes on pronotum, fig. 393*A*, forming two separate narrower stripes on clavus. . . . . 2. *colon*



*A*, head and pronotum; *B*, female genitalia.

Fig. 393.—*Commellus colon*.

Fig. 394.—*Commellus comma*.

Fig. 395.—*Stirellus bicolor*.

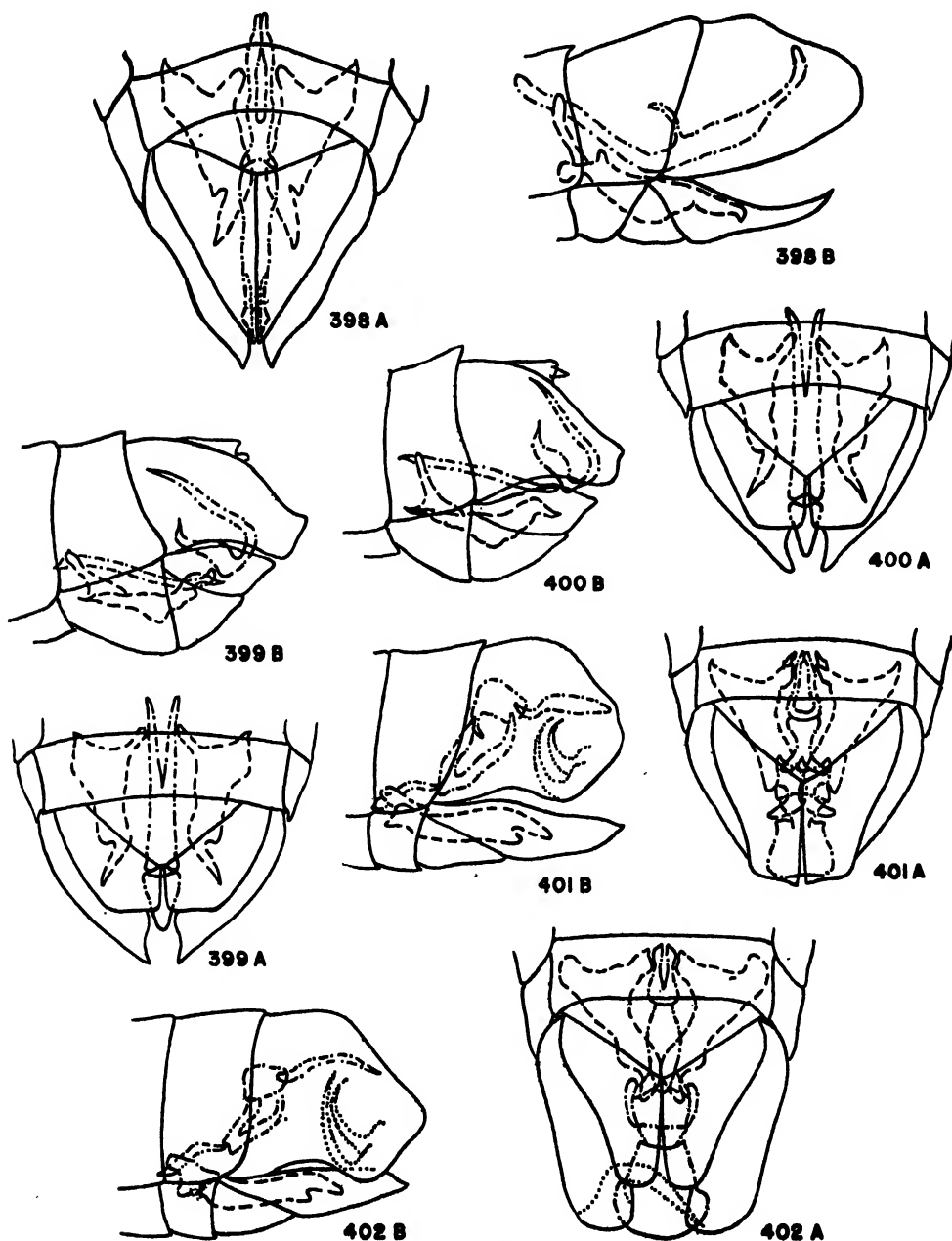
Fig. 396.—*Stirellus obtutus*.

Fig. 397.—*Amblysellus curtisii*.

1. *Commellus comma* (Van Duzee)*Athysanus comma* Van Duzee (1892b, p. 114).

Fig. 392. Length 4.5–5.0 mm. Broad, stout, creamy white, marked with brown.

Vertex, fig. 394A, obtusely angulate, two-thirds as long as basal width between eyes; four black spots on anterior margin extending onto face; a pair of black spots at base of vertex. Pronotum and scutellum with



Male genitalia. A, ventral aspect; B, lateral aspect.

Fig. 398.—*Amblysellus curtisii*.Fig. 399.—*Stirellus obtutus*.Fig. 400.—*Stirellus bicolor*.Fig. 401.—*Commellus comma*.Fig. 402.—*Commellus colon*.

four parallel longitudinal stripes. Elytra creamy white, the two bands from pronotum coalescing and extending across each clavus; a broad brown band on claval suture and a narrower band on inner branch of first sector. Female seventh sternite, fig. 394B, with prominent posterior angles, between which the posterior margin is deeply, concavely excavated with a shallow black-margined incision at apex. Male plates, fig. 401, narrowed at apex to about half their basal width; apices broad and blunt.

This is a middle western and northeastern species, and in Illinois occurs in the same association as *Dorycephalus platyrhynchus*. It is reported by Osborn & Ball (1897) as occurring on *Elymus canadensis*, but has not been definitely associated with this species of plant in Illinois.

**Illinois Records.**—DECATUR: June 29, 1935, Frison & Mohr, 19♂, 14♀. GALENA: July 10, 1934, DeLong & Ross, 2♀. LILLY: June 11, 1914, 1♀. ST. JOSEPH: June 27, 1915, 1♀. WESTERN SPRINGS: Aug. 16, 1936, 1♀. ZION: July 25, 1934, H. H. Ross, 1♀.

## 2. *Commellus colon* (Osborn & Ball)

*Athysanus colon* Osborn & Ball (1897, p. 223).

Length 4.5–5.0 mm. Pale, resembling *comma* but with more dark stripes on the elytra. Vertex, fig. 393A, two-thirds as long as width between eyes. Vertex, pronotum, and scutellum with spots and stripes as in *comma*. Each elytron with eight brownish stripes as follows: three on clavus, two of which are continuous with stripes on pronotum and scutellum, one on commissural line, and four on disc of elytron.

Female seventh sternite, fig. 393B, with posterior margin deeply and angularly excavated, black margined at apex. Male plates, fig. 402, short, broad, narrowed to about half their basal width at apices, which are broadly rounded.

This is a distinctly marked species, and the eight stripes on the elytra and the characters of the internal male genitalia serve to separate it from *comma*. A prairie species that occurs on *Stipa spartea*, *colon* is known to occur only in the states of Iowa, Minnesota, and Illinois.

**Illinois Records.**—ELGIN: prairie hill, Aug. 10, 1945, Ross & Sanderson, 12♂, 7♀; Aug. 1, 1944, Ross & Sommerman, 2♀.

## 69. *DORATURA* Sahlberg

*Doratura* Sahlberg (1871, p. 291).

Fig. 240. The vertex is rounded, shorter at middle than width between eyes. The anterior margin of vertex is rather sharply angled, slightly overhanging the front; slightly depressed just behind the middle of disc of vertex. The ovipositor is long and slender.

One species of this genus is known to have been imported from Europe and is well established in Wisconsin.

### 1. *Doratura stylata* (Boheman)

*Athysanus stylatus* Boheman (1847, p. 31).

Length 3.5–4.0 mm. Gray to brownish, with three conspicuous black spots on anterior margin of vertex. Vertex broadly rounded, produced at middle, more than half as long at middle as basal width between the eyes, longer than pronotum. Elytra short, leaving most of abdomen exposed. Dorsal portion of abdominal segments with a series of spots or dots that usually form longitudinal rows. Face pale, marked with two rather broad conspicuous transverse black bands. Female seventh sternite broad, with posterior margin truncate, not produced. Ovipositor long, slender, decidedly longer than pygofer. Male plates short, rather broad, rounded.

This species has not been collected in Illinois.

## 70. *DRIOTURA* Osborn & Ball

*Driotura* Osborn & Ball (1898, p. 87).

Fig. 403. Head short, transverse, almost parallel margined, obtusely conical. Eyes large, face short and broad. Pronotum short, transversely striate posteriorly. Elytra coarsely rugose, short, extending either to second abdominal segment only or almost to end of abdomen.

The members of this genus are grass-feeding species and are found in pastures or prairie habitats. Three species and three varieties are known for the United States. Three of these have been taken in Illinois, and one other may occur here.

### KEY TO SPECIES

1. Black, reddish brown, or in part tawny yellow.....2

- Gray, vertex and pronotum marked with white.....1. *robusta*  
 2. Vertex and pronotum reddish brown.....  
       .....3. *gammaroides* var. *fulva*  
 Vertex and pronotum black.....3  
 3. Shiny black, without definite pale markings.....2. *gammaroides*  
 Black, with elytra and last two or three segments of abdomen tawny yellow....  
       .....4. *gammaroides* var. *flava*

### 1. *Driotura robusta* Osborn & Ball

*Driotura robusta* Osborn & Ball (1898, p. 87).

Length 2.75–3.5 mm. Small, robust, gray, with light bands on pronotum. Vertex short, transverse, almost parallel margined, twice as wide as long; a median longitudinal line, two spots on disc, a band between vertex and front, and a stripe on base with white lines extending forward from it along the eyes. Face with a black band near clypeus, pale above, with dark arcs. Pronotum with anterior third black, white posteriorly, often bordered with black on lateral margins. Elytra black, with nervures and ramose lines connecting them light. Light colored specimens almost white.

Female seventh sternite slightly emarginate posteriorly. Male plates with inner margins rounded, outer edges emarginate, apices obtuse, widely separated.

This species occurs on small grasses and is frequently found in certain meadow or prairie habitats. It is recorded from the Middle West, but is not yet known from Illinois.

### 2. *Driotura gammaroides* (Van Duzee)

*Athysanus gammaroides* Van Duzee (1894b, p. 209).

Fig. 403. Length 3–4 mm. Short, black, robust, with long or short elytra. Vertex bluntly conical, twice as wide as long; usually glossy black, often with scattered reddish-brown markings. Legs and spines often reddish brown. Female seventh sternite broadly and convexly rounded. Male plates with outer margins convexly rounded to bluntly pointed apices.

This is a common grass-feeding species in meadows and pastures east of the Rocky Mountains.

**Illinois Records.**—Many males and females, taken April 10 to September 27, are from Adair, Alsip, Alton, Barry, Beach, Carlinville, Cave in Rock, Danville, Dar-

win, Dolson, Dongola, Dubois, Effingham, Eichorn, Elizabethtown, Evergreen Park, Grafton, Golconda, Havana, Karnak, Kin-

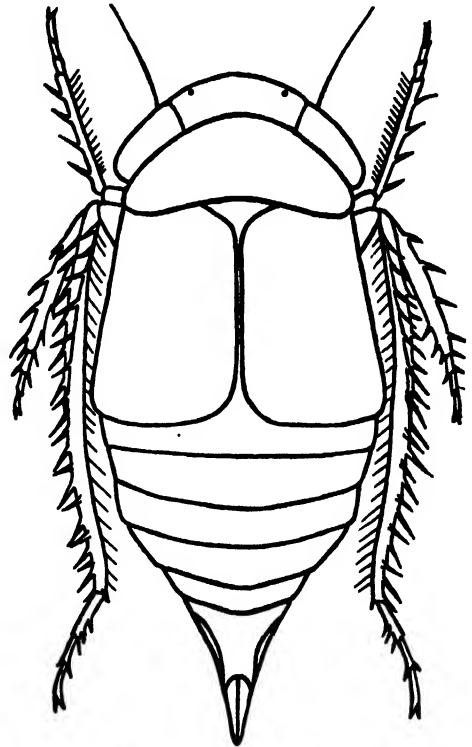


Fig. 403.—*Driotura gammaroides*.

mundy, Marshall, Metropolis, Mozier, Muncie, Niota, Oak Lawn, Oquawka, Parker, Pulaski, Shawneetown, Summit, Thebes, Thomson, Ursa, Vienna, and Zion.

### 3. *Driotura gammaroides* var. *fulva* Ball

*Driotura gammaroides* var. *fulva* Ball (1903, p. 231).

The coloration of this variety is reddish brown on vertex, pronotum, the last two segments of abdomen, pygofer, and ventral surface. The elytra and the remainder of the abdominal segments are almost uniform dark brown.

This variety is found in fewer numbers but in the same habitat as typical *gammaroides*.

**Illinois Records.**—DONGOLA: Aug. 22, 1916, 1♀. DUBOIS: Aug. 9, 1917, 1♂, 1♀. METROPOLIS: Aug. 20, 1916, 2♂, 1♀. MOZIER: July 28, 1936, Mohr & Burks, 3♂, 1♀. MUNCIE: cattail bog, Aug. 20, 1936,

B. D. Burks, 1 ♂. NIOTA: dry bog, July 28, 1936, Mohr & Burks, 1 ♀. URSA: July 29, 1936, Mohr & Burks, 1 ♀.

4. *Driotura gammaroides* var. *flava*  
Osborn & Ball

*Driotura gammaroides* var. *flava* Osborn & Ball (1898, p. 90).

Vertex, pronotum, and basal portion of abdomen black. The elytra and last two or three segments of abdomen yellow.

This variety occurs in the same habitats and in association with typical *gammaroides* and var. *fulva*.

Illinois Records.—Males and females, taken June 21 to August 23, are from Barry, Dubois, Evergreen Park, Kinmundy, Metropolis, Oak Lawn, Oquawka, Parker, Thomson, Vienna, and Zion.

71. *ATHYSANELLA* Baker

*Athysanella* Baker (1898c, p. 185).  
*Nephotettix* Matsumura (1902, p. 378).

Fig. 237. Head wider than pronotum, vertex somewhat produced, obtusely angulate, rounded to front, somewhat depressed on disc. Each hind tibia in male with or without strong spine at apex; spine, if present, about half as long as first tarsal segment.

Ball & Beamer (1940) recorded 45 species of *Athysanella*, including the subgenus *Amphipyga*, from the United States. Most species of this group are distributed from Kansas west to California, but two species of *Amphipyga* are known to occur in Illinois, and at least one *Athysanella* may occur here.

KEY TO SPECIES

1. Each hind tibia of male with spur at apex ..... 1. *robusta*  
Each hind tibia of male without apical spur ..... 2
2. Males ..... 3  
Females ..... 4
3. Plates, fig. 404A, longer than wide, sinuate on sides; elytra marked with faint lines ..... 2. *acuticauda*  
Plates, fig. 404B, wider than long, angled on sides; elytra marked with broad stripes ..... 3. *balli*
4. Seventh sternite broadly emarginate or subtruncate on posterior margin, sometimes indented at middle, and with a broad median longitudinal dark band ..... 2. *acuticauda*

Seventh sternite broadly rounded or subtruncate on posterior margin, distinctly emarginate on inside of lateral angles, and with a very narrow posterior marginal dark band. .... 3. *balli*

1. *Athysanella robusta* Baker

*Athysanella robusta* Baker (1898c, p. 187).

Length 3.0–3.75 mm. Pale gray, with two shiny black spots near the eyes, also brown spots at apex of vertex and on the disc. Pronotum with three pairs of black dots near the front margin. Elytra with veins whitish, cells somewhat infuscated. Abdomen striped. Female seventh sternite deeply excavated, median lobe about half as long as lateral lobes. Male pygofers rounded, subangulate on posterior borders. Plates short, half as long as pygofers, divergent, rounded posteriorly. Styles elongate, each with two long widely separated spurs curved at tips.

Although this species has not been collected in Illinois, it occurs in Iowa and Nebraska and will probably be found in the western or northwestern part of the state.

Subgenus *Amphipyga* Osborn

*Amphipyga* Osborn (1928, p. 289).

Vertex short, rounded or slightly angulate, usually with two conspicuous black spots or lines between the ocelli. Males without tibial spurs. Female ovipositor extremely long, extended beyond pygofers. Male pygofers inflated or elongate.

Most of the species of this subgenus are western and only two are known to occur in Illinois. They live on very short grasses and are found abundantly in the plains or short-grass region, or on the short grasses of the barren-appearing sandy plains.

2. *Athysanella (Amphipyga) acuticauda*  
Baker

*Athysanella acuticauda* Baker (1898c, p. 187).

Length 3–4 mm. Dull greenish to brownish, robust. Vertex blunt, angularly or roundedly produced, with a pair of large round black spots extending to front, and with a spot on middle of front visible from above. Elytra usually short, covering only basal two or three segments of abdomen, occasionally reaching almost to tip of abdomen; elytra often striped with brown, abdomen marked with brownish spots and darker

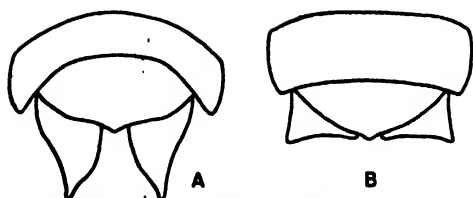


Fig. 404.—*Athysanella*, male plates. A, *acuticauda*; B, *balli*.

areas. Female seventh sternite emarginate posteriorly on either side of a slightly produced broad median lobe. Male plates, fig. 404A, short and broad, divergent, notched on outer margins, apices bluntly pointed.

A common species in dry upland pastures and prairie habitats, *acuticauda* is the most common and widely distributed of all the species of the subgenus. It occurs from Maine to Colorado and Montana.

**Illinois Records.**—Many males and females, taken May 10 to August 28, are from Apple River Canyon State Park, Evergreen Park, Galena, Grand Detour, St. Anne, Volo, Warren, Wauconda, and Zion.

### 3. *Athysanella (Amphipyga) balli* (Osborn)

*Amphipyga balli* Osborn (1928, p. 289).

Length 3 mm. Light gray, resembling *acuticauda* in form and size. Vertex broad, slightly angled and as long as pronotum, with a round black spot on each side of apex extending to front, and with a small black dot at apex. Elytra dark brown, veins white so that elytra appear longitudinally striped. Female seventh sternite truncate or slightly sinuate. Male plates, fig. 404B, short triangular, sinuate on inner margins, apices blunt.

This species has been taken in prairie habitats and in barren sandy areas on sparse patches of short grass. It occurs also on dry upland pastures and in meadows. It was previously recorded from Iowa and Ohio.

**Illinois Record.**—ALTON: June 27, 1934, DeLong & Ross, 10 ♀.

## 72. *EXITIANUS* Ball

*Exitianus* Ball (1929, p. 5).

Fig. 216. Characterized by a bluntly angled vertex, convex between eyes, anterior margin rounded to front, and front not inflated. Venation of elytra simple, apical cells much longer than broad; appendix of each elytron broad. Ovipositor extremely

long, acutely produced, greatly exceeding the slender pygofer.

Only one of the two species of this genus is known to occur in Illinois.

### 1. *Exitianus obscurinervis* (Stål)

*Thamnotettix obscurinervis* Stål (1858, p. 293).

*Cicadula exitiosa* Uhler (1880, p. 72).

*Athysanus miniaturatus* Gibson (1919, p. 26).

Length 3.5–5.0 mm. Variable in color and markings. Vertex obtusely angled, almost twice as wide at base as median length; vertex pale grayish white, often tinged with orange yellow; ocelli red, a pair of large round black spots on the margin, often a smaller one between these two, also two oblique dashes on basal angles, a transverse crescent mark between the anterior extremities and parallel to the anterior margin. Pronotum with irregular black spots. Triangular spots in basal angles of scutellum brown. Elytra hyaline, nervures dark fuscous.

Female seventh sternite, fig. 287C, with posterior margin subtruncate, slightly, convexly produced at middle. Male plates, fig. 287A, long, narrow, gradually tapering outer margins slightly concave, tips acute, often divergent. Aedeagus as in fig. 287B.

This is a very common and abundant species throughout the United States on several types of plants. It occurs especially on grasses, and attacks many cultivated crops, particularly small grains and legumes.

**Illinois Records.**—Many males and females, taken May 7 to November 22, are from Alton, Anvil Rock, Bloomington, Bradley, Carman, Cave in Rock, Champaign, Chicago, Collinsville, Danville, Decatur, Dongola, Dubois, East Cape Girardeau, Evergreen Park, Fern Cliff, Gibsonia, Golconda, Grand Detour, Harrisburg, Havana, Herod, High Knob, Jonesboro, Mahomet, Marshall, Mason City, Mederosia, Metropolis, Monmouth, Moweaqua, Niota, Norris City, Oak Lawn, Onarga, Oquawka, Palos Park, Port Byron, Quincy, Springfield, Starved Rock State Park, Thomson, Topeka, Urbana, Vienna, Villa Ridge, Watson, White Heath, and Zion.

## 73. *EUSCELIS* Brullé

*Euscelis* Brullé (1832, p. 109).

Body broad and robust. Vertex bluntly and conically produced, disc between eyes

convex, margin thick, rounded to front. Elytra broad, usually shorter than abdomen, second cross nervure often present, apical cells short and broad.

Eight species of this genus are known for the United States, and two are recorded for Illinois. At least one other species may occur here.

#### KEY TO SPECIES

1. Length not exceeding 4 mm. Each male plate, fig. 407A, truncate at apex; excavation of female seventh sternite, fig. 405A, with a prominent apical tooth..... 1. *relativus*  
Length 5 mm. or more. Each male plate not truncate at apex; tooth in excavation of female seventh sternite, if present, very small..... 2
2. Vertex, fig. 405B, broadly rounded, less than half as long at middle as width between eyes. Each male plate, fig.

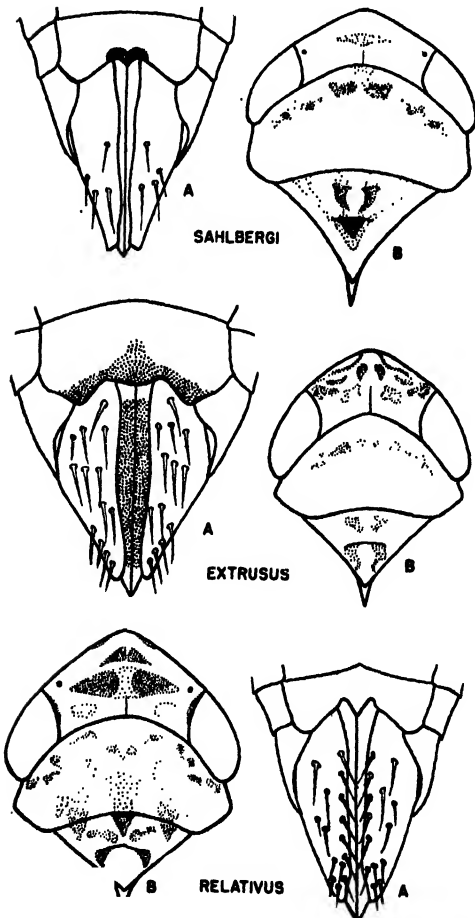
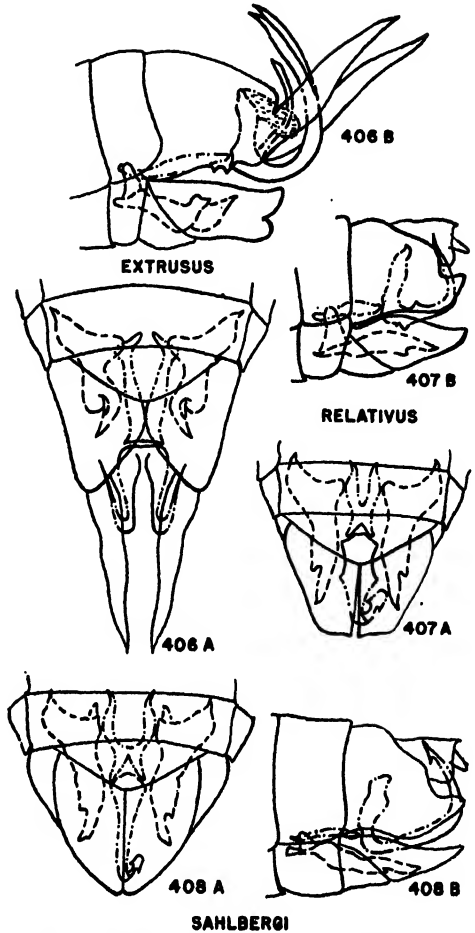


Fig. 405. — *Euscelis*. A, female genitalia; B, head and pronotum.



Figs. 406-408. — *Euscelis*, male genitalia. A, ventral aspect; B, lateral aspect.

408A, with bluntly rounded apex; excavation of female seventh sternite, fig. 405A, angular and with a minute black tooth..... 2. *sahlbergi*  
Vertex, fig. 405B, obtusely angled, almost three-fourths as long at middle as width between eyes. Each male plate, fig. 406A, with blunt divergent apex. Female seventh sternite, fig. 405A, with basal margin of excavation broadly and rounded produced..... 3. *extrusus*

#### 1. *Euscelis relativus* (Gillette & Baker)

*Athysanus relativus* Gillette & Baker (1895, p. 93).

Length 4 mm. Short, stout, pale brownish to straw colored, marked with fuscous. Vertex, fig. 405B, obtusely angled, a little more than half as long as basal width between the eyes, often with a few irregular pale markings. Ocelli red. Elytra subhya-

line, nervures indistinct. Female seventh sternite, fig. 405A, with lateral angles rounded to posterior margin, which is rather deeply and roundedly excavated; apex with a black acutely pointed tooth. Male plates, figs. 407A, 407B, about as long as combined basal width, narrowed to about half their width at apexes, which are broad and truncate.

This is a grass-feeding species recorded from the northeastern states. It has been taken from timothy, and apparently its habitat conditions are quite similar to those of *extrusus* and *sahlbergi*.

## 2. *Buscelis sahlbergi* (Reuter)

*Athysanus sahlbergi* Reuter (1880, p. 220).  
*Buscelis deceptus* Sanders & DeLong (1917, p. 87).

Length 5.5–6.0 mm. Yellowish, marked with brown. Vertex, fig. 405B, broadly rounded, more than twice as wide between eyes as median length; with irregular transverse brown markings. Ocelli red. Pronotum and scutellum with irregular brown spots. Elytra dull yellow, with indistinct nervures and brownish markings. Female seventh sternite, fig. 405A, with lateral angles rounded to a broadly and angularly excavated posterior margin that bears at its apex a short median black tooth. Male plates, figs. 408A, 408B, broad, convexly rounded to blunt apexes.

This species occurs in the New England states and west to South Dakota, and is found in fresh-water marshes.

**Illinois Records.**—DES PLAINES: Sept. 4, 1935, Frison & DeLong, 1 ♂. FOX LAKE: June 26, 1936, Frison & DeLong, 2 ♂, 1 ♀; June 30, 1935, DeLong & Ross, 1 ♂; Aug. 12, 1937, Ross, 3 ♂. GRAYS LAKE: June 10, 1936, Ross & Burks, 1 ♂, 1 ♀. OAK LAWN: summer, 1934, at light, 1 ♀. VOLO: in bog, June 11, 1936, Ross & Burks, 1 ♂. ZION: July 16, 1935, DeLong & Ross, 1 ♀.

## 3. *Buscelis extrusus* (Van Duzee)

*Athysanus extrusus* Van Duzee (1893, p. 283).

Length 5–6 mm. Broad, stout, yellowish, with dark markings. Vertex, fig. 405B, obtusely angled, almost three-fourths as long as width between eyes, with a pair of oblique fuscous spots at apex and a transverse spindle-shaped spot between eyes. Pronotum and scutellum with irregular

markings. Elytra pale yellow, nervures paler, areoles margined with fuscous; in pale specimens, markings often faint or wanting. Female seventh sternite, fig. 405A, with lateral lobes pointed, posterior margin rather broadly and deeply excavated, the margin of excavation slightly produced at middle. Male plates, figs. 406A, 406B, with outer margins sloping, inner margins divergent, forming blunt almost rounded apexes.

This species, previously recorded from the northeastern states, occurs in moist habitats on grasses. It has been taken in low wet pastures and meadows and is frequently found in fresh-water marshes.

**Illinois Records.**—ELIZABETH: July 7, 1917, 1 ♀. GRAND DETOUR: July 2, 1934, DeLong & Ross, 1 ♀. OAKWOOD: May 30, 1932, T. H. Frison, 1 ♀. OREGON: June 21, 1917, 1 ♀; June 30, 1935, DeLong & Ross, 3 ♂, 1 ♀. URBANA: June 18, 1889, 1 ♀; May 1, 1890, C. A. Hart, 1 ♀; June 2, 1890, C. A. Hart, 1 ♀; July 27, 1891, Marten, 1 ♂; July 29, 1891, Terrill, 1 ♂.

## 74. *OPHIOLA* Edwards

*Ophiola* Edwards (1922, p. 206).

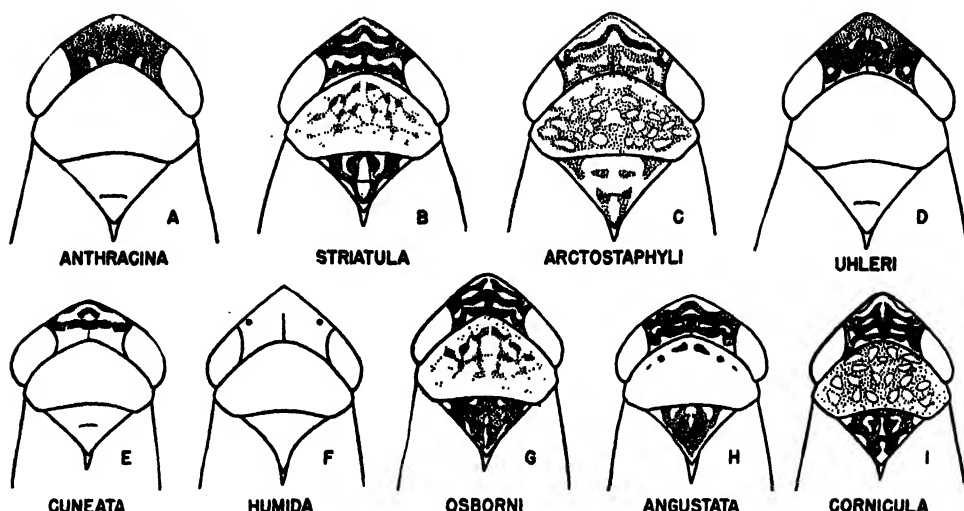
Vertex produced before anterior margins of eyes, acutely conical, disc not strongly convex between eyes, sloping regularly from pronotum to apex. Form small, narrow, and elongate.

The 20 or more species of this genus are usually found in bogs or heaths, occurring on *Vaccinium*, *Arctostaphylos*, and *Symphoricarpos*; probably a few species occur in marsh habitats. Five species are recorded for Illinois, and at least four others may occur in this state.

### KEY TO SPECIES

1. Elytra short, reaching tip of or only slightly exceeding abdomen; apical cells relatively short.....2
- Elytra longer, definitely longer than abdomen; apical cells long and narrow...5
2. Length 4.0 mm. or more.....3
- Length not exceeding 3.5 mm.....4
3. Color shiny black, vertex, fig. 409A, broadly rounded, scarcely longer at middle than next to eyes.....1. *anthracina*
- Dark in color, not shiny black, vertex, fig. 409D, with yellowish lines or spots, distinctly longer at middle than next to eyes.....2. *uhleri*
4. Vertex, fig. 409F, sulfur yellow, without definite markings.....3. *humida*



Fig. 409.—*Ophiola*. A–I, heads and pronota.

- Vertex, fig. 409C, tawny, with three transverse fuscous bands.....4. *arctostaphyli*
5. Vertex, fig. 409E, scarcely longer at middle than next to eyes, marked with one black transverse band; length not exceeding 3.5 mm.....5. *cuneata*  
Vertex definitely longer at middle than next to eyes, with three transverse bands or indefinite markings; length exceeding 4.0 mm.....6
6. Slender, elongate; elytra long, greatly exceeding abdomen in length; abdomen reaching about to apex of clavus.....7
- Broader, more robust, not slender; elytra not greatly exceeding abdomen, latter extending to about cross nervures of apical cells.....8
7. Vertex, fig. 409I, distinctly and obtusely angled, twice as long at middle as next to eyes and with three distinct dark transverse bands; length 4.5 mm.....6. *cornicula*  
Vertex, fig. 409H, broadly rounded, one-half longer at middle than next to eyes; markings indefinite, bands not distinct; length not exceeding 4.0 mm.....7. *angustata*
8. Color olive; fore and middle femora twice banded with white.....8. *striatula*  
With a definite orange coloration; fore and middle femora shiny black, abruptly orange at apexes, tibia orange.....9. *osborni*

### 1. *Ophiola anthracina* (Van Duzee)

*Athysanus anthracinus* Van Duzee (1894a, p. 136).

Length 4 mm. Small, robust, shiny black. Vertex, fig. 409A, obtusely conical, two-thirds as long as width between eyes, with

two spots on posterior margin farther from each other than from the eyes. Female seventh sternite, fig. 410C, with posterior margin slightly and roundedly produced. Male plates, figs. 410A, 410B, triangular, longer than combined basal width, convexly rounded to sharp-pointed apices.

This is a meadow species and is also found on herbaceous plants in wooded or shaded areas in the northeastern states and west to Colorado.

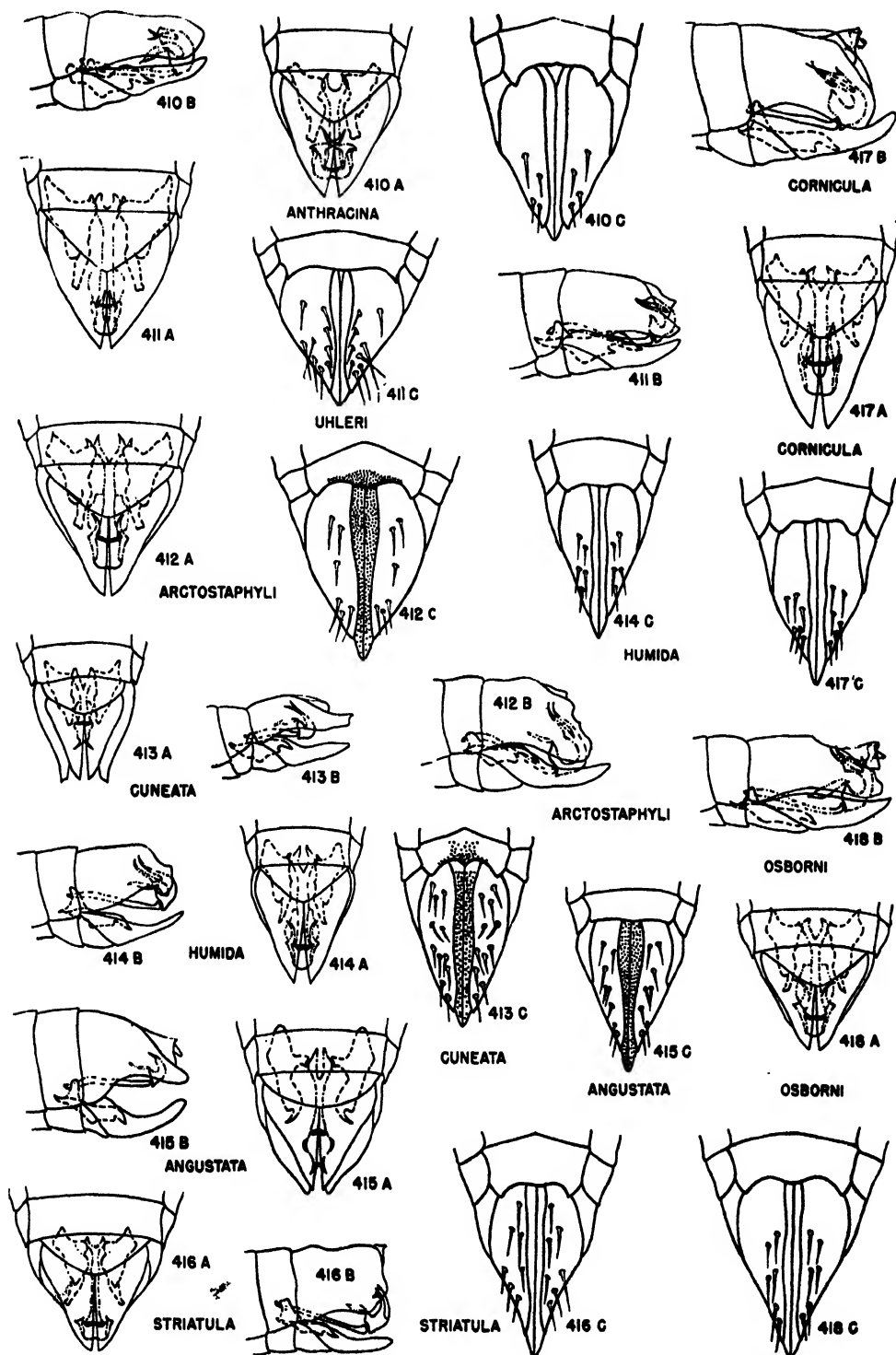
**Illinois Records.**—EICHORN: June 24, 1932, Ross, Dozier, & Park, 1 ♀. HAVANA: sand prairie, Nov. 17, 1913, 4 nymphs. NORMAL: June 22, 1883, 1 ♂, 2 ♀. NORTHERN ILLINOIS: 2 ♂, 3 ♀. RISING: July 16, 1888, C. A. Hart, 1 ♀. ST. JOSEPH: June 27, 1915, 1 ♂. THEBES: July 11, 1935, DeLong & Ross, 1 ♀. URBANA: June 13, 1889, C. A. Hart, 1 ♂; June 30, 1889, 1 ♂. VIENNA: June 14, 1934, DeLong & Ross, 1 ♂, 8 ♀; July 29, 1934, DeLong & Ross, 1 ♀.

### 2. *Ophiola uhleri* (Ball)

*Athysanus uhleri* Ball (1911, p. 200).

*Athysanus plutonius* Provancher (1889, p. 282). Misidentification of *plutonius* Uhler.

Length 4 mm. Broad, robust, black to brownish. Vertex, fig. 409D, distinctly angled, twice as wide between eyes as median length; a line on posterior margin of vertex, an oblique spot against either eye, and a pair of median apical spots yellowish. Elytra short and broad, truncate posteri-



Figs. 410-418.—*Ophiola*. A, ventral aspect of male genitalia; B, lateral aspect of male genitalia; C, female genitalia.

only, usually dark, nervures occasionally paler. Female seventh sternite, fig. 411C, with posterior margin roundedly produced, lateral angles bluntly rounded. Male plates, figs. 411A, 411B, triangular, longer than combined basal width, convexly rounded to rather broad pointed apices.

Ranging through the northeastern states and west to Colorado, this species occurs in wet meadow associations.

**Illinois Records.**—ANTIOCH: July 5–7, 1932, T. H. Frison, 1 ♂. KANKAKEE: July 20, 1934, DeLong & Ross, 1 ♀. VOLO: July 27, 1934, DeLong & Ross, 1 ♀.

### 3. *Ophiola humida* (Osborn)

*Athysanus humidus* Osborn (1915, p. 131).

Length 3.5 mm. Resembling *arctostaphyli* but with a yellowish unmarked head. Vertex, fig. 409F, obtusely angled, a little more than twice as long at middle as next to eyes. Pronotum and scutellum yellow, with faint fuscous markings. Elytra pale brown, subhyaline, nervures pale, bordered with fuscous. Female seventh sternite, fig. 414C, with rounded lateral angles, between which the posterior margin is almost truncate. Male plates, figs. 414A, 414B, triangular, longer than combined basal width, gradually narrowed to pointed apices.

This species has been taken only in bog habitats in Maine and Wisconsin. It should occur in bogs in the northeastern part of Illinois.

### 4. *Ophiola arctostaphyli* (Ball)

*Athysanus arctostaphyli* Ball (1899a, p. 172).

Length 3.5 mm. Tawny yellow, with transverse fuscous markings on the head. Vertex, fig. 409C, bluntly angled, a little more than one-half as long at middle as width between eyes; anterior transverse mark produced forward in a loop toward apex, second almost straight, and the basal one is confluent with the second by a common area on median line. Scutellum with fuscous spots in basal angles and a pair of bilobed spots on disc. Elytra testaceous subhyaline, nervures pale, heavily bordered with fuscous.

Female seventh sternite, fig. 412C, with lateral angles produced, between which the posterior margin is slightly produced on either side of the produced median third. Male plates, figs. 412A, 412B, triangular,

gradually narrowed to rather sharp-pointed apices.

This is primarily a heath species reported from the northeastern states. Also it has been collected from the bearberry, *Arctostaphylos*, in Colorado. This plant is found growing along the shores of Lake Michigan in Illinois, and *arctostaphyli* may at some time be found there.

### 5. *Ophiola cuneata* (Sanders & DeLong)

*Euscelis cuneata* Sanders & DeLong (1920, p. 17).

Length 3.0–3.5 mm. Small, wedge-shaped, greenish yellow. Vertex, fig. 409E, almost parallel margined, slightly and roundedly produced, with black transverse band between eyes just back of ocelli. Elytra distinctly longer than abdomen, smoky subhyaline, nervures yellowish. Female seventh sternite, fig. 413C, with prominent lateral angles, posterior margin strongly produced on either side of a dark median obtuse tooth. Male plates, figs. 413A, 413B, long, tapering gradually to acute tips.

This species is common in the eastern states in moist habitats at lagoon margins in the *Juncus-Cyperus* association. In general appearance, it resembles some species of *Limotettix*, especially *striolus*, with which it is often collected.

### 6. *Ophiola cornicula* (Marshall)

*Jassus corniculus* Marshall (1866, p. 198).

*Jassus orichalceus* Thomson (1869, pp. 56, 72).

*Jassus plutonius* Uhler (1877, p. 470).

*Athysanus instabilis* Van Duzee (1893, p. 284).

*Athysanus elongatus* Osborn (1915, p. 129).

Length 4.5 mm. Narrow, yellowish, with long elytra. Vertex, fig. 409I, distinctly angled, more than one-half as long at middle as width between the eyes, with three dark transverse lines as in *arctostaphyli*, lines heavier than in that species, the basal one extending forward near each eye and touching the median band. Elytra greatly exceeding abdomen, testaceous, subhyaline, nervures pale, heavily margined with fuscous.

Female seventh sternite, fig. 417C, with posterior margin slightly and roundedly produced. Male plates, figs. 417A, 417B, triangular, gradually narrowed to pointed apices.

This species has been taken in the *Juncus-Cyperus* fresh-water marsh habitat, espe-

cially in the northeastern states, but no other detailed habitat records are available.

**Illinois Record.**—CHEMUNG: Aug. 13, 1937, 1 ♀.

### 7. *Ophiola angustata* (Osborn)

*Athysanus angustatus* Osborn (1915, p. 130).

Length 4 mm. Greenish yellow to brownish, resembling *cornicula*. Vertex, fig. 409H, broadly rounded, more than twice as wide between eyes as length at middle, with irregular markings. Elytra with nervures pale, bordered with fuscous.

Female seventh sternite, fig. 415C, almost truncate on posterior margin, lateral angles very blunt, not produced. Male plates, figs. 415A, 415B, triangular, slightly concave on apical halves, apexes acutely pointed.

This species is northern in distribution.

### 8. *Ophiola striatula* (Fallen)

*Cicada striatula* Fallen (1826, p. 45).

*Athysanus vaccinii* Van Duzee (1890a, p. 135).

Length 4.0–4.5 mm. Olivaceous yellow. Vertex, fig. 409B, obtusely angled, twice as wide between eyes as median length, with three transverse black bands. Elytra longer than abdomen, testaceous, subhyaline, nervures white, tinted with olive, heavily margined with fuscous. Female seventh sternite, fig. 416C, with lateral angles produced, bluntly acute, between which the posterior margin is broadly and concavely rounded and slightly produced at middle. Male plates, figs. 416A, 416B, triangular, as long as combined basal width, apexes bluntly pointed.

This species occurs in Europe and North America; in the United States it ranges from Maine to Colorado. It has been taken from *Vaccinium* in bogs. It is quite variable in coloration, size, and markings.

**Illinois Records.**—LONG LAKE: Aug. 11, 1906, 4 ♂, 11 ♀. NORMAL: June 27, 1883, 1 ♂, 1 ♀. VOLO: July 8, 1932, Ross, Dozier, & Mohr, 1 ♂, 1 ♀; July 27, 1934, DeLong & Ross, 17 ♂, 8 ♀; in bog, Aug. 24, 1935, 4 ♂, 10 ♀.

### 9. *Ophiola osborni* Ball

*Ophiola osborni* Ball (1928, p. 190).

Length 4.0–4.5 mm. In general appearance similar to *symphoricarphae* Ball but

slightly smaller and darker in color. Pale brownish. Vertex, fig. 409G, twice as wide as median length, tinted with red and with three transverse dark bands. Elytra testaceous subhyaline, nervures pale, heavily bordered with fuscous. Front dark, with faint orange arcs. Femora usually dark to near apexes, then orange, as are the tibiae. Female seventh sternite, fig. 418C, with lateral angles bluntly rounded, between which the posterior margin is broadly and concavely rounded, with the median third slightly produced. Male genitalia as in figs. 418A, 418B.

Distributed from Maine and Maryland west to Colorado and Montana, this is an upland species occurring in dry habitats.

**Illinois Records.**—FAIRFIELD: June 12, 1934, DeLong & Ross, 1 ♀. ST. ANNE: Aug. 21, 1934, DeLong & Ross, 1 ♀.

### 75. *OPSIUS* Fieber

*Opsius* Fieber (1866, p. 505).

Vertex short, broadly rounded, and somewhat produced, almost parallel margined, rounded to front, without a definite margin. Elytra long, without extra costal veinlets.

Only one species of the genus is known to occur in the United States, and it is abundant throughout Illinois.

#### 1. *Opsius stactogalus* Fieber

*Opsius stactogalus* Fieber (1866, p. 505).

*Eutettix osborni* Ball (1907, p. 39).

Length 4.0–4.5 mm. Pale green, flecked with white on elytra. Vertex rounded. Pronotum darker green than elytra, irregularly mottled on disc, paler anteriorly. Elytra dark green to apex of each clavus, apical portions smoky, subhyaline; an irregular white band between the green and smoky portions, a round white spot in the apex of the central anteapical cell, and several irregular white flecks on the green portion. Female seventh sternite with posterior margin rounded and slightly produced at middle. Male plates triangular, gradually narrowed to acutely pointed apexes. Aedeagus as in fig. 288B.

This transcontinental species is widespread and abundant. It is commonly found on the ornamental tamarix, which is apparently its only known food plant.

**Illinois Records.**—HARRISBURG: at light, June 15, 1934, DeLong & Ross, 1 ♂, 3 ♀.

HAVANA: July 2, 1934, DeLong & Ross, 1 ♀. KANKAKEE: at light, July 22, 1935, DeLong & Ross, 2 ♂, 5 ♀. ONARGA: Aug. 29, 1934, DeLong & Ross, 1 ♂. URBANA: June 19, 1934, H. H. Ross, 5 ♂, 11 ♀.

## 76. *LIMOTETTIX* Sahlberg

*Limotettix* Sahlberg (1871, p. 224).

*Drylix* Edwards (1922, p. 207).

This genus is characterized by a short vertex, not extremely broad, which is slightly produced, almost parallel margined, rounded to front. Ocelli distinctly below the level of vertex. Venation of elytra simple, apical cells elongate.

The species belonging to this genus are all found on the grasses and sedges in the fresh-water marsh and are very similar in appearance. Nine species are recorded for the United States. At least three of these are known to occur in Illinois, and several others may occur here.

### KEY TO SPECIES

1. Vertex slightly produced; male plates triangular or elongate, not excavated on inner margins near apex, as in fig. 419G; female seventh sternite broadly and concavely excavated, as in fig. 419B. . . . . 2
- Vertex not produced, almost parallel margined; each male plate excavated on inner margin near apex, or short, truncate, or broadly rounded at apex, as in fig. 419M; female seventh sternite with only median third notched or excavated, as in fig. 419C. . . . . 3
2. Male plates, fig. 419G, elongate, more than one-half longer than combined basal width; female seventh sternite, fig. 419B, rather broadly, angularly excavated half the distance to base. . . . . 1. *utahnus*  
Male plates, figs. 419F, 419J, shorter, triangular, not longer than combined basal width; female seventh sternite, fig. 419D, broadly, shallowly excavated not more than one-third the distance to base. . . . . 2. *striolus*
3. Male plates, figs. 419L, 419M, concave on inner margins before each apex, apices convergent, caliper-like; female seventh sternite, fig. 419C, shallowly, angularly notched on median third. . . . . 3. *divaricatus*  
Male plates short, truncate, or broadly rounded at apices; female seventh sternite concavely rounded on median third. . . . . 4
4. Male plates, figs. 419E, 419I, very short, with apices broadly truncate; female seventh sternite slightly concave on posterior margin on either side of median excavation. . . . . 4. *truncatus*

Male plates, figs. 419H, 419K, longer, apices broadly rounded; posterior margin of female seventh sternite, fig. 419A, strongly, convexly rounded on either side of median excavation. . . . . 5. *parallelus*

### 1. *Limotettix utahnus* (Lawson)

*Drylix utahnus* Lawson (1931b, p. 590).

Length 5.0–5.5 mm. Resembling *striolus*; vertex but slightly produced at middle, a little more than twice as wide as long, yellow, with the usual black transverse bands. Pronotum dirty yellow, with signs of brownish mottling on anterior third. Elytra smoky yellow, nervures paler, cells smoky to brown. Face yellow, with arcs of the front and sutures black. Female seventh sternite, fig. 419B, with the posterior margin broadly, concavely rounded about half way to base. Male plates, fig. 419G, triangular and very long, their bluntly pointed apices greatly exceeding pygofers.

This is a fresh-water marsh species, reported previously from the Rocky Mountain region, that has been taken in the western part of Illinois.

Illinois Record.—MORRIS: June 18, 1938, Williams, 1 ♂, 1 ♀.

### 2. *Limotettix striolus* (Fallen)

*Cicada striola* Fallen (1806, p. 31).

Length 4–5 mm. Greenish yellow, wedge shaped. Vertex slightly produced, not quite twice as wide as median length, with a transverse black band just back of ocelli. Elytra pale greenish hyaline, nervures pale. Female seventh sternite, fig. 419D, with lateral margins obliquely sloping, posterior margin broadly and concavely excavated. Male plates, figs. 419F, 419J, about as long as combined basal width, convexly rounded to bluntly angled apices.

This is a common fresh-water marsh and swamp species that ranges from the north-eastern states to Colorado and occurs in the *Juncus-Cyperus-Phragmites* association.

Illinois Records.—Many males and females, taken May 2 to October 5, are from Algonquin, Antioch, Aurora, Beach, Cave in Rock, Cedar Lake, Champaign, Dixon, Elgin, Evergreen Park, Fox Lake, Freeport, Fulton, Galena, Havana, Herod, McHenry, Oak Lawn, Orangeville, Palos Park, Putnam, Sheffield, Thomson, Urbana, Vienna, Volo, Waukegan, and Zion.

### 3. *Limotettix divaricatus* (Sanders & DeLong)

*Euscelis divaricatus* Sanders & DeLong (1923, p. 151).

Length 5.5 mm. Greenish yellow, resembling *parallelus*. Vertex almost parallel, not produced, with black transverse band just

### 4. *Limotettix truncatus* Slesman

*Drylix truncatus* Slesman (1930, p. 100).

Length 5.0–5.5 mm. Greenish yellow, resembling *parallelus*. Vertex broad, almost parallel margined, not produced, with the usual broad black band just back of ocelli. Anterior margin of pronotum narrowly

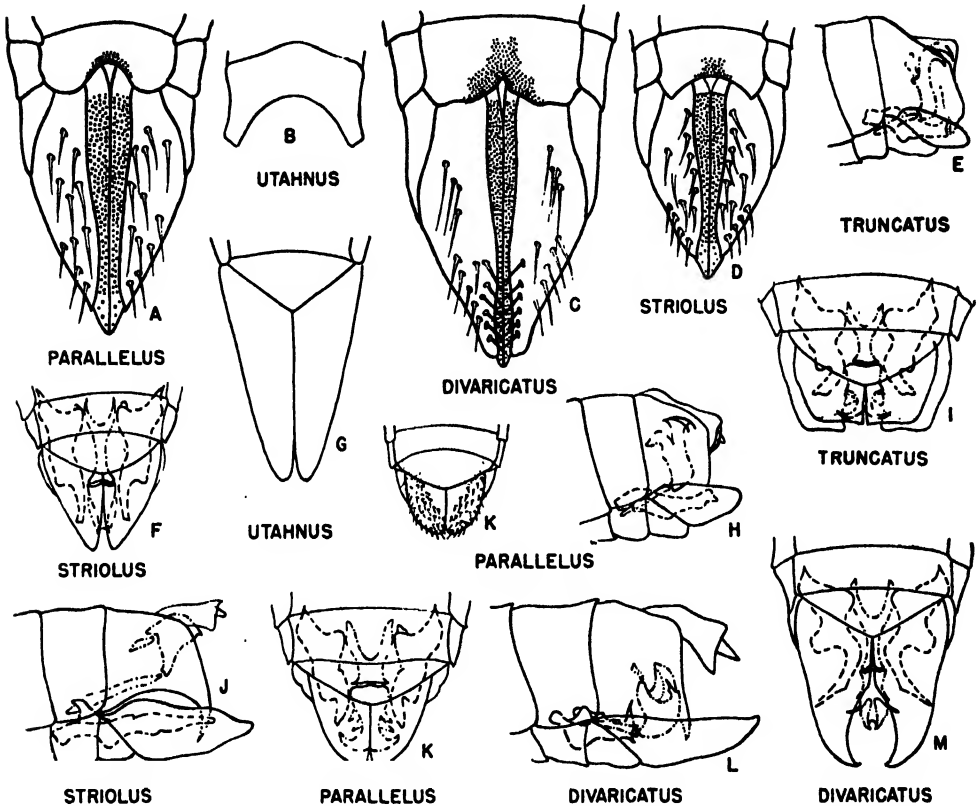


Fig. 419.—*Limotettix*. A–D, female genitalia; E–M, male genitalia, ventral and lateral views.

back of ocelli, and a small spot at apex. Elytra smoky. Female seventh sternite, fig. 419C, with posterior margin almost truncate, slightly and angularly excavated on median third. Male plates, figs. 419L, 419M, about one-half longer than combined basal width, the outer margins convexly rounded, inner margins concavely rounded on apical half to form widely divergent acutely pointed tips; these appear caliper-like when viewed ventrally.

This is a rather scarce fresh-water marsh species that apparently occurs in widely separated areas. It is recorded from Pennsylvania and Idaho, and may eventually be taken in Illinois.

black, a broad transverse black band on disc of posterior half. Disc of scutellum black, a black spot in each basal angle. Elytra dark, nervures pale. Female seventh sternite with median third of posterior margin shallowly concave between the lateral margins and the sharp point where the median excavation meets the posterior margin. Male genitalia as in figs. 419E, 419I.

A fresh-water marsh species taken in small numbers, *truncatus* is known only from the central states. Apparently it is not so abundant as *striolus* and *parallelus*.

**Illinois Records.**—ODIN: May 28, 1910, 1 nymph; May 30, 1910, 6♂, 3♀. URBANA: July 2, 1889, C. A. Hart, 20♂, 15♀; July

15, 1889, Terrill, 2 ♀; Aug. 15, 1890, Miss Snyder, 8 ♂, 4 ♀.

### 5. *Limotettix parallelus* (Van Duzee)

*Athysanus parallelus* Van Duzee (1891, p. 169).

Length 6 mm. Pale yellowish or greenish, resembling *striolus* but larger. Vertex distinctly parallel margined, not produced, with a broad black band just back of ocelli. Elytra subhyaline, nervures with yellowish tint. Female seventh sternite, fig. 419A, with posterior margin truncate, a broad U-shaped notch on median third extending about half way to base. Male plates, figs. 419H, 419K, three-fourths as long as basal width, gradually narrowed to rather broad rounded apices.

This species is found commonly in association with *striolus* in the fresh-water marsh on the *Juncus-Cyperus-Phragmites* association. Its range is from the north-eastern states to Colorado.

**Illinois Records.**—BEACH: swamps, Aug. 21, 1906, 3 ♂, 5 ♀. MCHENRY: July 27, 1934, DeLong & Ross, 3 ♂, 10 ♀. PRINCETON: July 7, 1934, DeLong & Ross, 6 ♂, 7 ♀; July 2, 1936, B. D. Burks, 2 ♂; June 28, 1937, Ross & Burks, 7 ♂, 5 ♀; July 2, 1937, Mohr & Burks, 1 ♀. ZION: July 16, 1935, DeLong & Ross, 1 ♂, 1 ♀.

### 77. *THAMNOTETTIX* Zetterstedt

*Thamnotettix* Zetterstedt (1838, col. 292).

Fig. 209. Vertex bluntly angled and also bluntly angled with front. Elytra with one crossvein between the first and second sectors. Second anteapical cell elongate, constricted at middle.

Although a large number of North American species have been described in or placed in *Thamnotettix*, most of these have been placed more recently in other genera because of the revised definition of the characteristics of this genus. At present, this genus contains only one species.

#### 1. *Thamnotettix simplex* (Herrich-Schaeffer)

*Jassus simplex* Herrich-Schaeffer (1833, fasc. 125, p. 7).

*Deltoccephalus chlamydatus* Provancher (1890, p. 339).

Length 5.5 mm. Dull olive green or brownish green, quite variable in shade and

intensity of color. Vertex paler, with an indistinct band on anterior portion between ocelli. Pronotum darker on disc and posterior margin. Scutellum with a pair of black spots on disc, basal angles black. Elytra smoky to brown, tinged with green.

Female seventh sternite slightly concave, slightly indented on either side of median third. Male valve triangular, plates a little longer than combined basal width, apices blunt, rounded to inner margins.

A European species commonly distributed in the northern and northeastern portions of the United States and Canada, *simplex* occurs on shrubby and herbaceous growth. It should occur in northern Illinois.

### 78. *MENOSOMA* Ball

*Menosoma* Ball (1931b, p. 4).

Fig. 219. Vertex broad, obtuse, sloping, usually a little longer on median line than next to eye; in lateral view rounded over to front to form an obtusely conical apex. Venation of elytra simple, second cross nervure of each absent, the two outer apical veinlets reflexed and expanded on the costa.

Only one of the two known species of this genus occurs in Illinois.

#### 1. *Menosoma cincta* (Osborn & Ball)

*Eutettix cincta* Osborn & Ball (1898, p. 97).

Length 5.5–6.0 mm. Greenish yellow, marked with brown. Vertex bluntly conical, almost one-half longer at middle than next to eyes, tinted with saffron. Pronotum irrorate. Scutellum pale, a pair of small spots on disc and a spot on each lateral margin. Elytra tinted with saffron, nervures red; a broad brownish band across posterior half of each clavus and obliquely extending back to costa; cross nervures on clavus broadly black, costal nervures black, and an area in the third apical cell sometimes black. Female seventh sternite with the posterior margin slightly rounded, a little produced at middle. Male plates long, broad at bases, concavely narrowed to slender upturned apices.

Distributed throughout the eastern states and west to Colorado, this is a common species, especially on herbaceous vegetation in wooded or shaded areas.

**Illinois Records.**—Many males and females, taken June 14 to November 17, are from Aldridge, Alton, Apple River Canyon

State Park, Cave in Rock, Danville, Dixon Springs, Dubois, Elizabethtown, Fern Cliff, Grand Detour, Grand Tower, Heathsville, Herod, Horseshoe Lake, Kankakee, Karnak, Metropolis, Oakwood, Rosiclare, St. Anne, Shawneetown, Temple Hill, Urbana, Vienna, Warren, Waukegan, and White Pines Forest State Park.

### 79. *ORIENTUS* DeLong

*Orientus* DeLong (1938c, p. 217).

Resembling *Paraphlepsius* by having ramose pigmented lines but with head conspicuously narrower than pronotum. Vertex transversely impressed behind apex. Lateral margins of pronotum strongly angulate. Elytron with one crossvein between first and second sectors.

Only one North American species of this genus has been recognized.

#### 1. *Orientus ishidae* (Matsumura)

*Phlepsius ishidae* Matsumura (1902, p. 382).  
*Phlepsius tinctorius* Sanders & DeLong (1919, p. 235).

Length of female 6 mm., male 5 mm. Vertex one-fourth wider than long, almost evenly rounded and parallel margined, with apex narrowly but decidedly inflated before a distinct depression; color ivory white, with small irregular black spot on either side of apex, an irregular semicircular black spot above each ocellus, and a large quadrangular orange spot on either side of median dark line, spot margined with irregular black lines. Pronotum short and broad, truncate posteriorly, with distinct flaring lateral angles, broader than head; color tawny, shading to darker, generally marked with vermicular brown lines. Scutellum nearly all orange, marked with brown, also an ivory spot on posterior margin midway between apex and lateral angle. Elytra milky, with pale tawny areas; tip of each clavus, margin of apex, and spots on costal margin dark brown. Face dark brown, with many pale spots.

Female seventh sternite smoothly truncate. Male valve, fig. 242, broadly and bluntly angled; plates long, triangular, evenly tapering to long curved tips, each laterally lobed before the apex.

Known in the United States only from New Jersey, this species has been taken on *Aralia spinosa*.

### 80. *MESAMIA* Ball

*Mesamia* Ball (1907, pp. 31, 59, 75).

Fig. 295. Vertex with the disc depressed, anterior margin usually elevated and acutely angled with the front, margin often slightly produced. Elytra with second cross nervure present, but sometimes obscure, and the central anteapical cell slightly constricted. Usually with several supernumerary veinlets along the clavus and costa.

Beamer (1942) recognized 15 species as belonging to this genus, nearly all of which are found only in the western United States. One species has been taken in Illinois, and two others may eventually be found here. They seem to be associated with the prairie habitat.

#### KEY TO SPECIES

1. A dark broad saddle on each elytron between the cross nervures.....1. **nigradorsum**  
Each elytron without a dark saddle spot.....2
2. Vertex depressed, with four spots on anterior margin, these connected by a line posteriorly; a broad dark band below vertex. Length 4.5-5.5 mm.....2. **straminea**  
Vertex flat, with a narrow line above and another below margin. Length 3.7-4.5 mm.....3. **coloradensis**

#### 1. *Mesamia nigradorsum* Ball

*Mesamia nigradorsum* Ball (1907, p. 60).

Length 4-5 mm. Milky white, marked with black. Vertex with margin ivory white, disc brown, a black line between ocelli anterior to which is a quadrate black spot on either side of median line. Face black. Pronotum with disc and anterior margin brown, these areas separated by a white transverse band. Elytra milky white, nervures brown, a dark brown or black saddle across the posterior two-thirds of each clavus, usually a narrow band at base and apex of clavus; costal veinlets black.

Female seventh sternite broadly, angularly excavated with a short median tooth about as long as its basal width, slightly bifid at apex. Male plates, fig. 294, a little longer than their combined basal width, narrowed slightly and concavely to acute apices.

Distributed through the eastern states and west to Utah, this conspicuously marked species occurs abundantly on the prairie on



*Helianthus* and produces black spots by its feeding punctures.

**Illinois Records.**—Many males and females, taken June 9 to October 31, are from Aldridge, Champaign, Des Plaines, Dubois, East St. Louis, Evergreen Park, Havana, Kinmundy, La Rue, Muncie, Niota, Oak Lawn, Palos Park, Princeton, St. Anne, Shawneetown, Starved Rock State Park, Summit, Urbana, Vienna, Waukegan, White Pines Forest State Park, Wolf Lake, and Zion.

## 2. *Mesamia straminea* (Osborn)

*Paramesus straminea* Osborn (1898, p. 241).

Length 4.5–5.5 mm. General color greenish to straw, with dark veins. Anterior and posterior margins of vertex ivory white, with an irregular black line interrupted at the middle, this sometimes reduced to four black spots behind the anterior margin. Pronotum with anterior half pale and posterior portion brownish. Elytra subhyaline, tinted with pale brown, three pairs of milky white spots along suture; nervures brown, costal veinlets fuscous. Face pale, a narrow black band just beneath vertex. Female seventh sternite with a sunken tooth as in *nigridorsum*. Male plates acutely pointed as in that species.

This insect occurs on a species of *Helianthus* and is found on the prairies in the Middle West and California.

## 3. *Mesamia coloradensis* (Gillette & Baker)

*Allygus coloradensis* Gillette & Baker (1895, p. 91).

*Paramesus immaculatus* Ball (1905, p. 211).

Length 3.7–4.5 mm. Resembling pale specimens of *straminea*, but smaller and with a flatter vertex. Vertex not produced but acutely angled with the front; usually marked by a fine black line on margin, interrupted at middle, and often with two black spots at base. Pronotum pale, with variable markings, disc irregularly irrorate, often spots near eyes; often without markings. Elytra short, strongly reticulate veined; greenish white to greenish brown, with dark nervures. Female seventh sternite with posterior margin shallowly and angularly excavated on either side of the median fifth, which is produced into a broad tooth as long as its basal width and notched at apex.

Male plates small, a little longer than basal width, concavely narrowed to acute apices.

This species occurs in Colorado and Utah; records for other areas are doubtful. It might be found in the western portion of Illinois.

## 81. *ALIGIA* Ball

*Aligia* Ball (1907, pp. 31, 53, 75).

Fig. 214. Head short, vertex rounded to front, a faint transverse curved depression between ocelli. Elytra long, usually subhyaline, nervures distinct, two cross-veins between first and second sectors and usually a number of veinlets in costal cell and next to claval suture.

Most of the 33 described species and subspecies of the genus, as recognized by Hepner (1939), occur only in the West or Southwest. One species, *modesta*, occurs in the Ohio River valley and has been taken in Illinois.

### 1. *Aligia modesta* (Osborn & Ball)

*Eutettix modesta* Osborn & Ball (1898, p. 98).

Length 4.5–5.5 mm. Fulvous, with a pair of tawny spots near apex of vertex and a pair of oblique marks inside the basal angles. Pronotum faintly irrorate with tawny. Elytra white, subhyaline, tinted with reddish fulvous, interrupted by two pale bands, an indefinite basal band and a narrow definite one across the second cross nervure. Female seventh sternite almost truncate, with a broad slightly rounded median projection. Male plates long, spoon shaped.

Distributed through the eastern half of the United States, this species is usually found on oak and is easily obtained in cut-over areas where oak shrubs grow abundantly.

**Illinois Records.**—CAVE IN ROCK: Oct. 2, 1934, Frison & Ross, 1 ♂. DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♀. DOLSON: July 24, 1936, DeLong & Mohr, 1 ♂. ELIZABETHTOWN: July 8, 1935, DeLong & Ross, 1 ♂. LA RUE: July 11, 1935, DeLong & Ross, 1 ♂, 3 ♀; Oct. 4, 1934, Frison & Ross, 1 ♂.

## 82. *NORVELLINA* Ball

*Norvellina* Ball (1931b, p. 2).

Fig. 229. Vertex broader than long, almost parallel margined, broadly rounded

to or slightly angulate with front. Venation simple, with one crossvein between the sectors, without true costal veinlets except the two at the ends of the first apical cell. Elytra covered by a saddle pattern of pigmented reticulate lines and veins.

Lindsay (1940) recorded for this genus 29 species and subspecies, chiefly western in distribution, as occurring in the United States. Four species are known from Illinois.

#### KEY TO SPECIES

1. Greenish yellow, often tinted with brown, but elytra without definite oblique pigmented bands. .... 1. *tenella*  
Elytra marked with oblique bands of ramoso pigment, often in the form of stripes along dorsal portions. .... 2
2. Elytra milky white, a broad brown band across posterior half of each elytron. .... 2. *seminuda*  
Elytra largely brownish. .... 3
3. Each elytron with a broad irregular whitish band in front of middle and slightly interrupted near suture by irregular pigmented lines. .... 3. *chenopodii*  
Costal region of each elytron in basal half with a large well-defined yellowish triangular area that extends on to the clavus and lateral margin of pronotum. .... 4. *pulchella*

#### 1. *Norvellina tenella* (Baker)

*Thamnotettix tenellus* Baker (1896b, p. 24).

Fig. 421. Length 3.0–3.5 mm. Varying in color from yellow to dark brown. Color markings indefinite, but dorsum often heavily infuscated. Vertex about one-fourth longer at middle than next to eyes. Easily distinguished from the other members of the genus by the unique genitalia. Female

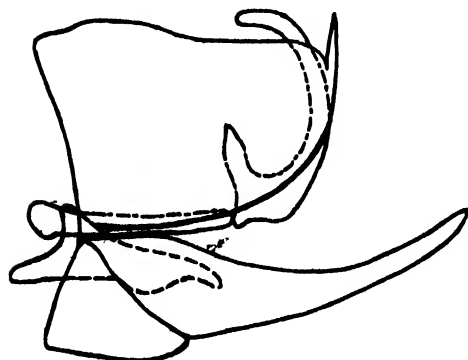


Fig. 420.—*Norvellina chenopodii*, male genitalia.

seventh sternite with posterior margin produced on median half, then narrowly, semi-circularly emarginate more than half way to base. Male plates short, broad, widest at apex, where they are roundedly truncate.

This is a widely distributed and an important economic species. Its occurrence in Illinois is both unusual and interesting.

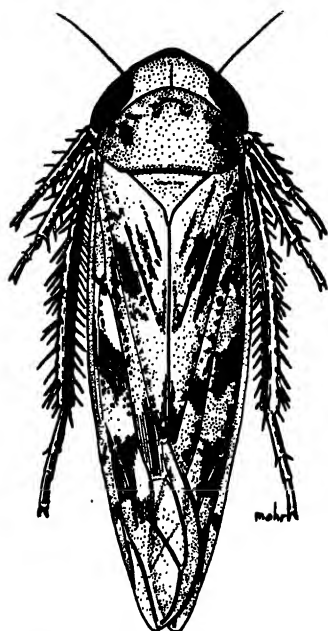


Fig. 421.—*Norvellina tenella*.

Several years ago it was found on its native food plant, the sea purslane, *Sesuvium portuacastrum*, along the Atlantic Coast on sandy beaches, but as far as is known these beach plants are not found in Illinois. It has been taken in abundance from a planting of horse-radish in Illinois, where it caused a diseased condition similar to curly top of sugar beets.

**Illinois Records.**—COLLINSVILLE: on horse-radish, Oct. 6, 1936, K. J. Kadow, 58 ♂, 34 ♀; on horse-radish, July 14, 1938, L. H. Shropshire, 1 ♀.

#### 2. *Norvellina seminuda* (Say)

*Jassus seminudus* Say (1831, p. 307).

Length 4.5–5.0 mm. Milky to creamy white, with a broad, brown saddle band on elytra. Vertex a little longer at middle than next to eyes. Scutellum often with irregular brownish markings. Elytra with the broad

brown saddle stripe across the posterior half of each clavus and narrowed to half that width on the costa; fourth apical cell often testaceous.

Female seventh sternite with posterior margin truncate or slightly produced, with a wedge-shaped median tooth, which is slightly notched at middle. Male plates long, triangular, apices narrowed, bluntly pointed.

This is one of our common conspicuously marked species, which frequently occurs on cultivated crops, although it apparently does not pass its life cycle upon them. It is found in the eastern states and in the Middle West.

**Illinois Records.**—Many males and females, taken May 7 to October 31, are from Algonquin, Alton, Alto Pass, Anna, Antioch, Beach, Bradley, Carman, Centerville, Champaign, Chicago, Clay City, Clayton, Collinsville, Danville, Decatur, Dixon, Dolson, Eichorn, Ernst, Evergreen Park, Fulton, Grafton, Grand Tower, Hamburg, Hanover, Hardin, Havana, Horseshoe Lake, Kampsville, Kankakee, Lima, Mahomet, Mason City, McHenry, Metropolis, Monmouth, Mount Carmel, Oak Lawn, Oquawka, Palos Park, Pike, Pulaski, Putnam, Quincy, Rosiclare, St. Anne, Savanna, Shawneetown, Urbana, Vienna, Volo, White Heath, White Pines Forest State Park, Wilmington, York, and Zion.

### 3. *Norvellina chenopodii* (Osborn)

*Eutettix chenopodii* Osborn (1923, p. 161).

Length 4.5–5.25 mm. Vertex a little longer at middle than next to eyes. Vertex, pronotum, and scutellum reddish brown, irrorate. Elytra milky white, with median saddle spot, a basal and an apical band on each elytron consisting of minute reddish-brown irrorations. Eyes reddish brown. Female seventh sternite usually slightly emarginate on either side of a broad short median tooth, which is notched at apex. Male plates, fig. 420, broad at bases, concavely rounded to elongate filamentous apices.

Distributed through the eastern states, the Middle West, and west to Utah, this is a common species on *Chenopodium*, on which it produces bright reddish spots by its feeding punctures. It frequently causes economic damage to spinach, swiss chard, and

beets, which belong to the same plant family as *Chenopodium*.

**Illinois Records.**—Males and females, taken May 18 to November 13, are from Algonquin, Alton, Anna, Antioch, Barry, Carbondale, Centralia, Champaign, Clay City, Cornfield, Decatur, Galena, Havana, Hillsboro, Kankakee, Keithsburg, Lawrenceville, Mason City, Monmouth, Monticello, Oak Lawn, Oakwood, Onarga, Oquawka, Palos Park, Pulaski, Putnam, Springfield, Urbana, Vienna, and Wilmington.

### 4. *Norvellina pulchella* (Baker)

*Eutettix pulchellus* Baker (1896b, p. 24).

Length 4.5 mm. Vertex only slightly longer at middle than next to eyes; testaceous brown, with an ivory line in front of the anterior depression into which extend four equidistant brown points. Pronotum with an ivory line on each lateral margin. Scutellum with three white spots, one on apex and one on each lateral margin. Elytron largely brownish except for a large yellowish triangular area, mostly in front of middle, which covers costal area and part of clavus; apical regions of elytra also with whitish areas but these irregular; three pairs of equidistant white spots on each clavus along suture. The female seventh sternite slightly rounded, median fourth slightly emarginate, with two minute teeth at apex extending slightly beyond margin. Male plates long, triangular, apices acute.

This beautifully marked species occurs in northern Illinois on *Eriogonum*.

**Illinois Records.**—GRAND DETOUR: Aug. 22, 1935, DeLong & Ross, 1 ♀. OAK LAWN: at light, summer 1934, DeLong & Ross, 1 ♂.

### 83. *REMADOSUS* Ball

*Remadosus* Ball (1929, p. 3).

Fig. 201. The genus is characterized by a very short and broad vertex, which is parallel margined, transverse, and broadly rounded to front. Ocelli situated in a slight depression distant from the eyes, distinctly below level of disc. Venation simple.

The three species of the genus are made up of large individuals that live in freshwater marshes on species of *Spartina*. Only one species is known to occur in Illinois.

1. *Remadosus magnus* (Osborn & Ball)

*Athysanus magnus* Osborn & Ball (1897, p. 225).

Length 7 mm. Vertex, fig. 201, short, almost parallel margined, four times as broad as long. Vertex, pronotum, and scutellum finely irrorate with fuscous, a transverse ivory band on pronotum. Elytra dark, nervures pale fuscous, with pale margins. Female seventh sternite, fig. 292C, with posterior margin triangularly notched at middle and with a rounded lobe on each side that is a little shorter than the produced lateral angles. Male genitalia as in figs. 292A, 292B.

This is a common inhabitant of the wet prairies of the Middle West and apparently feeds upon species of *Spartina*. It is reported from *Spartina michauxiana* in Iowa and Colorado, and in Florida it has been taken from the salt marsh, where it apparently feeds on *Spartina patens*.

Illinois Records.—AMBOY: Aug. 8, 1934, DeLong & Ross, 3 ♂. ANTIOCH: Aug. 27, 1932, Ross & Mohr, 1 ♀. EVERGREEN PARK: Aug. 23, 1934, DeLong & Ross, 2 ♀; July 1, 1935, DeLong & Ross, 2 ♂. OAK LAWN: July 27, 1934, DeLong & Ross, 1 ♀; in lamp globe, Aug. 22, 1934, DeLong & Ross, 3 ♂; July 1, 1935, DeLong & Ross, 1 ♂; Sept. 6, 1935, T. H. Frison, 1 ♀. OGDEN: July 17, 1928, H. H. Ross, 1 ♀. SUMMIT: July 17, 1935, DeLong & Ross, 2 ♀.

84. *TROPICANUS* DeLong

*Tropicanus* DeLong (1944a, p. 87).

Fig. 202. Very similar to *Paraphlepsius* but with very short lateral pronotal margins. Eyes appearing almost to touch bases of elytra. Vertex rounded to front. This genus is represented in the United States by a single species.

1. *Tropicanus costomaculatus*  
(Van Duzee)

*Allygus costomaculatus* Van Duzee (1894b, p. 207).

*Phlepsius pulchripennis* Baker (1898a, p. 65).

Length 5 mm. Vertex angularly produced, a little longer at middle than next to eyes, slightly less than twice as wide as long; disc faintly marked with brown. Pronotum strongly produced anteriorly, nearly

truncate on posterior margin; faintly marked with brownish spots and small red dots, and with two darker spots behind each eye. Elytra largely hyaline, veins darker, and with three irregular longitudinal brownish areas on each clavus, one on disc of each elytron, and one on each costal vein. Seventh sternite of female produced at middle one-third into a rounded lobe, which is a little longer than the rounded lateral angles.

This species is known only from Texas.

85. *PARAPHLEPSIUS* Baker

*Paraphlepsius* Baker (1897, p. 158).

Figs. 422, 423, 427. Vertex as wide as or wider than pronotum, with margin thin, acutely angled with front, or rounded to front without a definite margin. Disc flat or sloping to front, without a transverse furrow. Elytra exceeding abdomen in length.

This is a large genus, of which 64 species have been recorded for the United States; 21 are known to occur in Illinois, and several others may be found here.

## KEY TO SPECIES

1. Females.....2  
Males.....27
2. Color patterns of elytra showing transverse banding, with paler and darker shades of brown, dark red or tawny...4  
Color patterns of elytra without transverse banding.....3
3. Front margin of vertex well produced, foliaceous.....24  
Front margin of head not strongly produced or foliaceous.....6
4. Seventh sternite definitely produced at middle, as in figs. 426B, 426X.....5  
Seventh sternite, fig. 426A, shallowly and concavely excavated, with a short median U-shaped notch....1. *optatus*
5. Seventh sternite, fig. 426B, notched at apex of produced portion, forming two distinct pointed teeth.....  
.....2. *tullahomi*  
Seventh sternite, fig. 426X, convexly rounded on median third, without teeth.....3. *strobl*
6. Vertex, pronotum, and scutellum yellowish or tawny; elytra heavily marked with brown or black pigment.....7  
Vertex, pronotum, and scutellum not definitely marked in contrast with elytra.....10
7. Length 7.5 mm.; seventh sternite, fig. 426V, with a broad shallow notch at center.....4. *rossi*  
Length not more than 6.0 mm.; median notch in seventh sternite narrow, as in fig. 426D.....8

8. Seventh sternite, fig. 426D, tapered apically, median portion produced with a median incision, forming two pointed appressed teeth.....5. *collitus*  
Seventh sternite not tapered apically, median portion notched, teeth not appressed, as in fig. 426F.....9

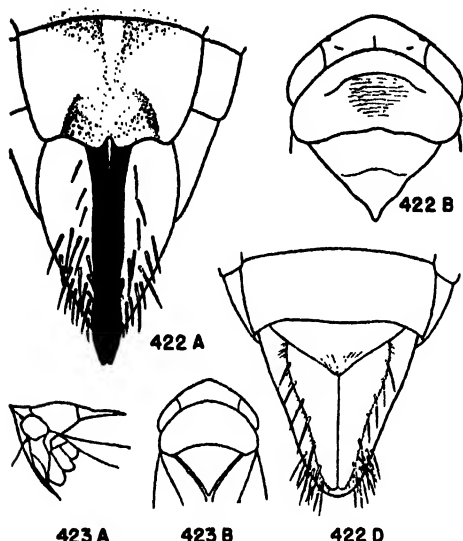


Fig. 422.—*Paraphlepsius umbrosus*. A, female genitalia; B, head and pronotum; D, male external genitalia.

Fig. 423.—*Paraphlepsius solidaginis*. A, lateral view of head and thorax; B, head and pronotum.

9. Length more than 5.5 mm.; elytra dark brown; median teeth of seventh sternite, fig. 426F, separated by V-shaped notch, margin of sternite broadly concave.....6. *fulvidorsum*  
Length not exceeding 5.25 mm.; elytra darker, appearing almost black; median teeth of seventh sternite, fig. 426G, broad, short, and rounded, separated by shallow, U-shaped notch, margin slightly notched between these and lateral angles.....7. *eburneolus*  
10. Vertex rounded in front, or slightly angulate.....11  
Vertex distinctly angulate, definitely longer at middle than next to eyes.....20  
11. Vertex short, margins parallel, or vertex rounded to front, or both.....12  
Vertex slightly longer at middle than next to eyes, angled with front.....15  
12. Seventh sternite, fig. 426C, broadly, deeply, angularly excavated on posterior margin practically the full width of sternite.....8. *latifrons*  
Seventh sternite notched only at center, not broadly and deeply excavated....13  
13. Seventh sternite, fig. 426J, notched at center, producing two proximal short and sharp-pointed teeth....9. *tigrinus*

- Seventh sternite with a broader notch, without proximal apical teeth, as in figs. 426I, 426U.....14  
14. Median three-fourths of seventh sternite, fig. 426U, produced decidedly beyond the lateral angles, with a broad deep V-shaped notch at center, producing two rounded lobes.....10. *maculosus*  
Median portion of seventh sternite, fig. 426I, not produced beyond lateral angles, notched on either side of two median apically rounded teeth or narrow lobes, which are separated by a broadly angular and shallow median emargination.....11. *turpiculus*  
15. Pale gray, marked with definite black spots on vertex, scutellum, and pronotum; clavus and costa of each elytron usually with a narrow irregular band across middle.....1. *optatus*  
Darker, brown without definite black spots except where coloration of face is visible on margin of vertex.....16  
16. Length not exceeding 5 mm.; ovate in form, short and broad.....17  
Length 6 mm. or more.....18  
17. Seventh sternite, fig. 426L, deeply and concavely emarginate, with median incision forming two rounded black-bordered sunken lobes.....12. *altus*  
Seventh sternite, fig. 426H, broadly, very shallowly concave; margin of excavation truncate, with a median V-shaped notch.....13. *pusillus*  
18. Seventh sternite, fig. 426N, with lateral margins roundedly narrowed to median half, which is deeply, broadly and angularly notched.....14. *incisus*  
Seventh sternite with distinct lateral angles, posterior margin shallowly concave, as in figs. 426O, 426P.....19  
19. Lateral angles of seventh sternite, fig. 426O, rounded, rather narrowly, roundedly emarginate between these and a pair of rounded teeth formed by a median incision.....15. *umbrosus*  
Lateral angles of seventh sternite, fig. 426P, sharply angled, very shallowly emarginate on either side to a minute median V-shaped notch; margin without produced teeth or lobes.....16. *lascivius*  
20. Seventh sternite, fig. 426W, with lateral margins rounded to posterior margin, which is truncate and very faintly and concavely emarginate on median third.....17. *truncatus*  
Seventh sternite with prominent produced lateral angles, posterior margin notched or excavated.....21  
21. Seventh sternite, fig. 426T, with median third squarely excavated half way to base and bearing a basal tooth as wide as excavation and extending half way to posterior margin.....18. *irroratus*  
Seventh sternite broadly excavated from lateral angles, with a median notch or incision.....22  
22. Excavation of seventh sternite, fig. 426R, composed of shallow emarginations on either side of a pair of median rounded teeth.....19. *tennessa*

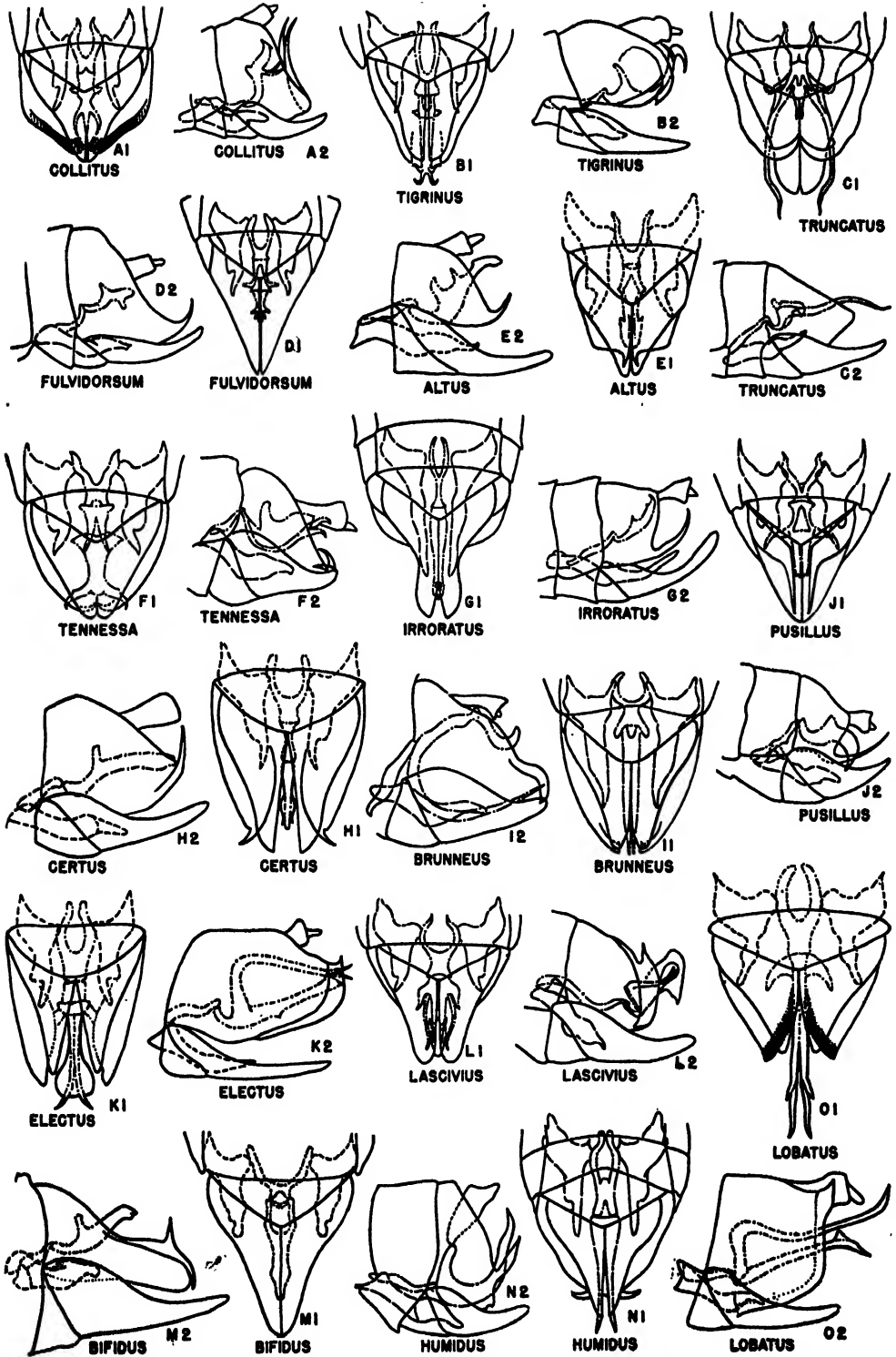


Fig. 424.—*Paraphlepsius*. A–O, male genitalia. 1, ventral aspect; 2, lateral aspect.

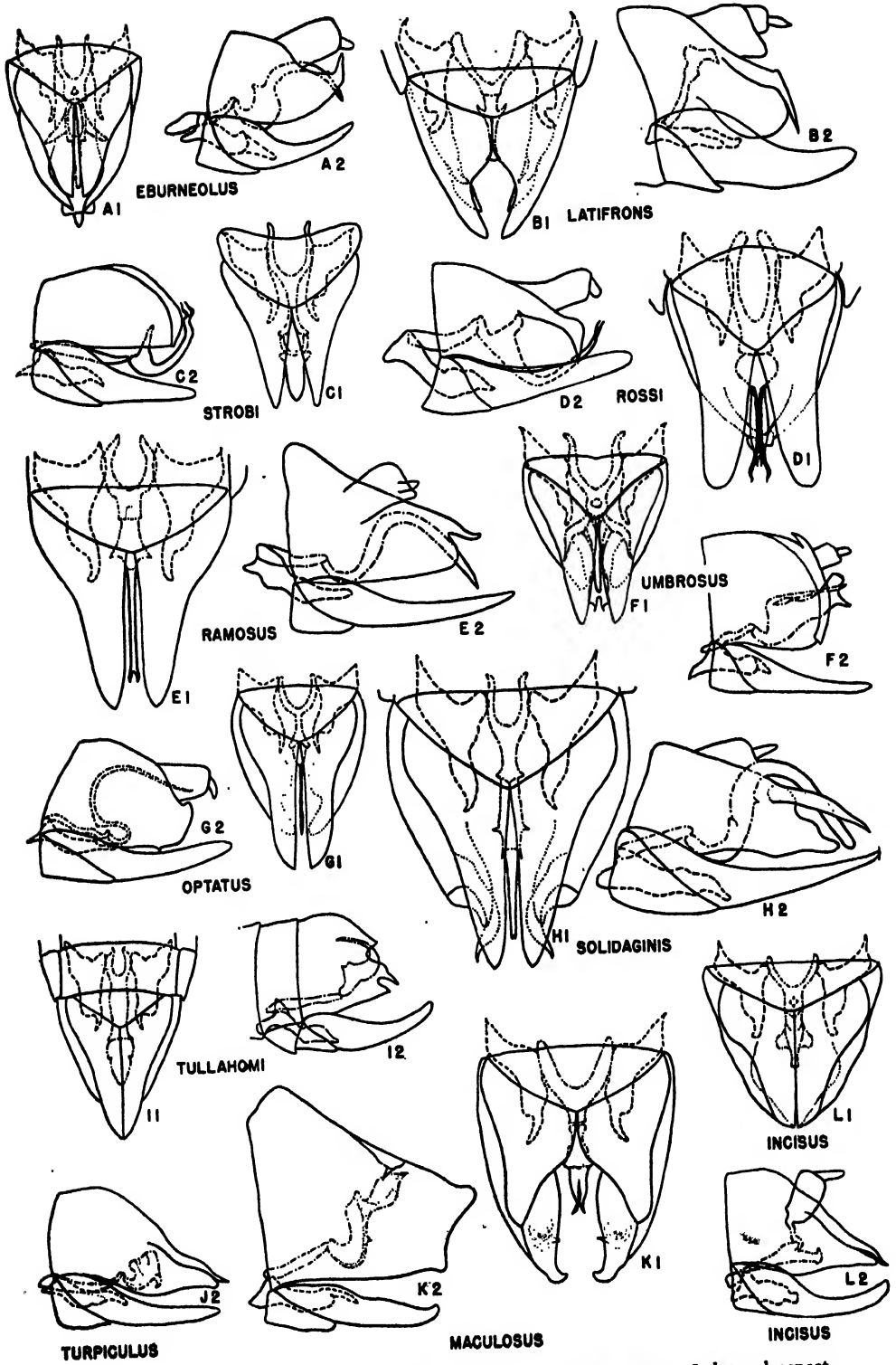


Fig. 425.—*Paraphlepsius*. A-L, male genitalia. 1, ventral aspect; 2, lateral aspect.

- Excavation deeper, squarely excavated from narrow pointed lateral angles... 23
23. Rounded median teeth, fig. 426K, separated by a narrow V-shaped median notch one-third the distance to base... 20. **brunneus**
- Rounded median teeth, fig. 426E, appressed, divided one-fifth the distance to base... 21. **lobatus**
- Color pattern of elytra without transverse banding... 28
28. Front margin of head well produced, foliaceous... 51
- Front margin of head not strongly produced or foliaceous... 31
29. Each pygofer, fig. 425I, notched on either side of a median spine on caudal margin... 2. **tullahomi**

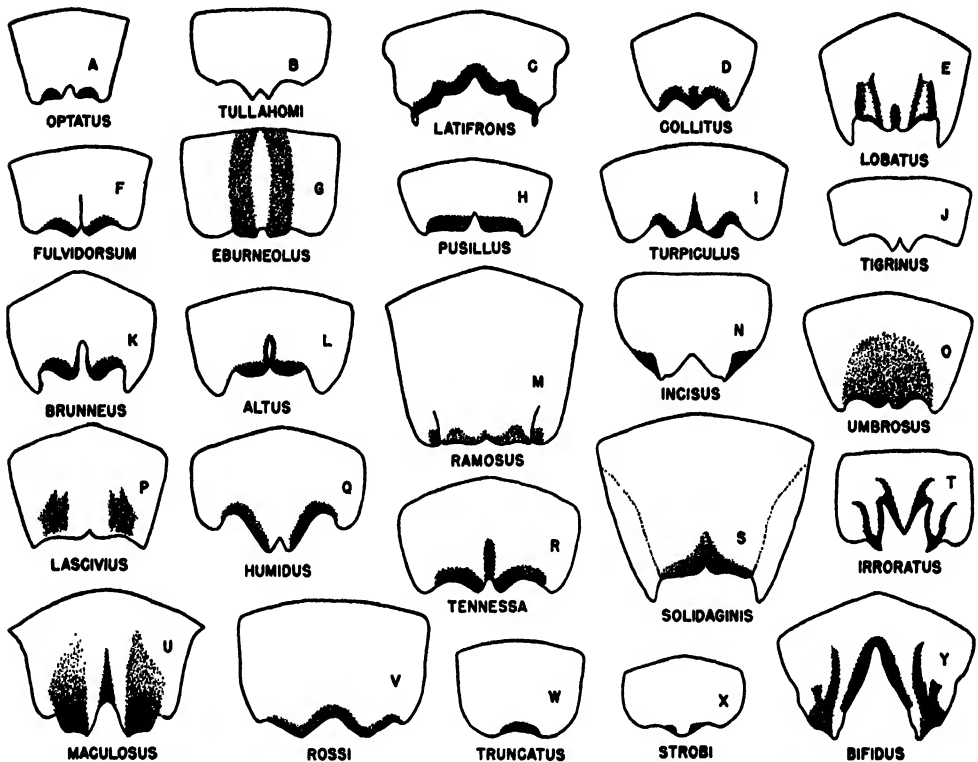


Fig. 426.—*Paraphlepsius*. A–Y, female seventh sternite.

24. Seventh sternite, fig. 426Q, with a bifid tooth at middle, which is produced decidedly beyond lateral angles... 22. **humidus**
- Seventh sternite truncate, notched or excavated, not produced at center... 25
25. Seventh sternite broadly excavated or notched from lateral angles... 26
- Seventh sternite, fig. 426M, truncate posteriorly, incised next to lateral angles, notched at middle... 23. **ramosus**
26. Seventh sternite, fig. 426Y, broadly, angularly notched two-thirds the distance to base from pointed lateral angles... 24. **bifidus**
- Seventh sternite, fig. 426S, broadly, shallowly excavated less than one-fifth the distance to base; anterior margin of excavation truncate, slightly notched at middle... 25. **solidaginis**
27. Color pattern of elytra showing transverse banding, with paler and darker shades of brown, dark red, or tawny... 29
- Each pygofer rounded, not notched on caudal margin... 30
30. Aedeagus, fig. 425G, long, very slender, curved dorsally, then caudally to caudal margin of each pygofer... 1. **optatus**
- Aedeagus, fig. 425C, shorter, broad at base, narrowed to a pair of finger-like tips... 3. **strobi**
31. Vertex, pronotum, and scutellum yellowish or tawny; elytra heavily marked with brown or black pigment... 32
- Vertex, pronotum, and scutellum not definitely marked in color, in contrast to elytra... 35
32. Pygofers, fig. 425D, with dorsocaudal spines directed ventrally... 4. **rossi**
- Pygofers with ventrocaudal spines or without spines... 33
33. Aedeagus short, with short dorsal and ventral processes... 34
- Aedeagus, fig. 425A, long, slender, convexly curved upward, without dorsal or ventral processes... 7. **eburneolus**



34. Each pygofer, fig. 424D, oblique caudally, terminating in a ventral, upturned, spinelike apex; aedeagus with very short ventral and dorsal processes. . . . . 6. *fulvidorsum*  
Each pygofer, fig. 424A, more truncate caudally, with a long heavy dorsally directed spine on ventrocaudal margin; aedeagus with a pair of rather long spines on ventral side. . . . . 5. *collitus*
35. Vertex rounded in front or slightly angulate. . . . . 36  
Head distinctly angulate, vertex longer at middle than next to eyes. . . . . 46
36. Vertex short, margins parallel, or vertex rounded to front, or both. . . . . 37  
Vertex slightly longer at middle than next to eyes, vertex angled with front. . . . . 40
37. Plates, fig. 425K, obliquely sloping on inner margins from bases so that they appear divergent. . . . . 10. *maculosus*  
Plates not obliquely sloping from bases on inner margins. . . . . 38
38. Vertex broadly rounded to front. . . . . 39  
Vertex bluntly angled with front, margin usually thick; genitalia as in fig. 425J. . . . . 11. *turpiculus*
39. Length not over 6 mm.; plates, fig. 424B, not concave on inner margins, inner margins straight, apices bluntly pointed. . . . . 9. *tigrinus*  
Length 7 mm. or more; plates, fig. 425B, concavely excavated on inner margins on apical halves, apices converging. . . . . 8. *latifrons*
40. Aedeagus, fig. 425G, long, very slender, filamentous, curved dorsally and extending to caudal margins of pygofers, without processes. . . . . 1. *optatus*  
Aedeagus usually short and broad, or, if elongated, then broader and with dorsal or lateral processes. . . . . 41
41. Length not over 5.5 mm. . . . . 42  
Length 6.0 mm. or more. . . . . 44
42. Aedeagus, fig. 424H, long, rather narrow, about the same width throughout, with a short erect dorsal process about one-third the distance from base. . . . . 26. *certus*  
Aedeagus not elongate, shorter and broader, wider at middle than at either end. . . . . 43
43. Each pygofer, fig. 424E, obliquely sloping to pointed apex, basal spine shorter; aedeagus with two dorsal toothlike processes and a blunt apex. . . . . 12. *altus*  
Each pygofer, fig. 424J, truncate caudally, basal spine long; aedeagus with one dorsal blunt tooth, apex curved ventrally, tapered, and pointed. . . . . 13. *pusillus*
44. Dorsal margin of each pygofer, fig. 425L, obliquely sloping to bluntly pointed apex at ventral margin; a long dorsal spine resting on dorsal margin and extending caudally beyond apex. . . . . 14. *inclusus*  
Dorsal margin of each pygofer not obliquely sloping to ventral margin, broadly rounded caudally, without long spine extending caudally. . . . . 45
45. Aedeagus, fig. 424L, abruptly and completely recurved ventrally and widened at apex; small dorsobasal processes extending into cavities formed by the recurved apex. . . . . 16. *lascivius*  
Aedeagus, fig. 425F, not recurved but straight, twice as long as broad, slightly narrowed before apex. . . . . 15. *umbrosus*
46. Pygofers with spines arising from the ventrocaudal angles, as in fig. 424G. . . . . 47  
Pygofer spines wanting or not arising on ventrocaudal margins. . . . . 48
47. Aedeagus, fig. 424G, simple in form, dorsal margin serrate; each pygofer appearing truncate caudally to basal spine. . . . . 18. *irroratus*  
Aedeagus, fig. 424F, broadly bifurcate at apex; each pygofer obliquely sloping from dorsal margin to ventrocaudal spines. . . . . 19. *tennessa*
48. Each pygofer, fig. 424I, tapered to bluntly pointed apex, with a dorsal spine directed ventrally over apex. . . . . 20. *brunneus*  
Each pygofer without dorsal apical spine directed ventrally. . . . . 49
49. Aedeagus, fig. 424C, composed of a short basal dorsally enlarged portion, from which a pair of long slender divergent tapering processes extend beyond margins of pygofers. . . . . 17. *truncatus*  
Ventral and dorsal processes of aedeagus elongate, as in fig. 424K. . . . . 50
50. Pygofers, fig. 424O, short, greatly exceeded by aedeagus processes; dorsal process of aedeagus considerably longer than ventral process. . . . . 21. *lobatus*  
Pygofers, fig. 424K, longer; aedeagus processes of approximately equal length and scarcely exceeding caudal margins of pygofers. . . . . 27. *electus*
51. Each pygofer, fig. 424N, shorter than basal width, with a ventrocaudal spine directed dorsally; aedeagus strongly, concavely curved upward. . . . . 22. *humidus*  
Each pygofer longer than basal width, spine dorso-caudal in position; aedeagus not curved concavely upward. . . . . 52
52. Aedeagus long, strongly curved in the form of an inverted sickle, as in fig. 425H. . . . . 53  
Aedeagus, fig. 424M, short, five times as long as broad, almost straight, with a short dorsal process near middle. . . . . 24. *bifidus*
53. Caudal margin of each pygofer, fig. 425E, notched, forming a short dorso-caudal spine. . . . . 23. *ramosus*  
Dorsal spine, fig. 425H, long, arising about one-third the distance from apex; dorso-caudal margin of each pygofer tapered to a bluntly pointed apex. . . . . 25. *solidaginis*

#### 1. *Paraphlepsius optatus* (Crumb)

*Phlepsius optatus* Crumb (1915, p. 194).

Length 5-6 mm. A species resembling *collitus* in general form and appearance but lighter in color. Vertex bluntly angled, a

little longer at middle than next to eyes and with margin thick and obtusely angled with front. Pale yellowish, with line on disc of vertex, two spots at base, a spot behind either eye on pronotum, two spots at apex, and two points on disc of scutellum black. Elytra white, sparsely inscribed; a black spot at middle and apex of each clavus, and black spots on costa; a faint irregular band across middle of clavus.

Female seventh sternite, fig. 426A, long, tapered, posterior margin very shallowly excavated; a short median U-shaped incision and a black marginal spot on either side. Male plates, fig. 425G, long, concavely narrowed at about half their length, then rather evenly produced to near apices, where they are convexly rounded to pointed apices on inner margins.

This species has erroneously been placed as a synonym of *cinereus* Van Duzee, but differs in external characters, and the aedeagus is entirely different. It is a common species on grasses at the margins of streams and in moist areas along the Illinois River in the willow-cottonwood habitat. It was recorded previously from Tennessee.

**Illinois Records.**—Many males and females, taken May 28 to October 2, are from Algonquin, Alton, Amboy, Barry, Cave in Rock, Danville, Duncans Mills, Fulton, Grafton, Hardin, Havana, Horseshoe Lake, Kampsville, Lima, Mahomet, Meredosia, Metropolis, Monticello, New Milford, Norris City, Oakwood, Olive Branch, Oregon, Pike, Quincy, Rock Island, Rosiclare, Springfield, Vienna, Wilmington, and Wolf Lake.

## 2. *Paraphlepsius tullahomi* (DeLong)

*Phlepsius tullahomi* DeLong (1916, p. 73).

Length 5.5–6.0 mm. Pale, with the posterior halves of elytra appearing banded. Vertex obtusely angled, one-fourth longer at middle than next to eyes, margin with a definite angle, acutely angled with front. Vertex, pronotum, and scutellum sparsely irrorate. Elytra sparsely marked on each anterior half, the posterior half densely marked with ramose pigment, a rather definite line on middle of clavus separating the two areas.

Female seventh sternite, fig. 426B, not narrowed apically, posterior margin slightly concave on either side of a median produced bifid tooth. Male plates, fig. 425I, long,

exceeding pygofer, concavely narrowed on either side about middle and produced to rather bluntly pointed apices.

This is apparently a pine species, occurring normally upon seedlings, and should be found in southern Illinois. It has been recorded from Alabama, Tennessee, and Ohio.

## 3. *Paraphlepsius strobi* (Fitch)

*Bythoscopus strobi* Fitch (1851, p. 58).

*Phlepsius uhleri* Van Duzee (1892a, p. 67).

*Phlepsius franconianus* Ball (1903, p. 228).

Length 4.5–5.0 mm. Small, generally brownish, with paler bands on elytra. Vertex bluntly angled, about one-half longer at middle than next to eyes, margin not sharp but rather definite, obtusely angled with front. Vertex fulvous, pronotum and scutellum brown. Elytra each with a white band across base from middle of scutellum to middle of clavus, a narrow band just beyond apex of clavus and a third just before apex of elytron.

Female seventh sternite, fig. 426X, with posterior margin slightly and roundedly produced on median third, a black spot on either side of middle, giving the appearance of a median tooth. Male plates, fig. 425C, long, gradually, slightly, and concavely narrowed to pointed apices.

This is one of the common pine species in the eastern United States and should be found in Illinois in the pine association.

## 4. *Paraphlepsius rossi* (DeLong)

*Phlepsius rossi* DeLong (1938b, p. 43).

Length 7.5 mm. Rather large, robust, with vertex, pronotum, and scutellum buff or dull yellow. Vertex bluntly angled, one-half longer at middle than next to eyes, margin of vertex angled with front. Vertex rather heavily irrorate with brown on margin at apex and on either side of middle. Pronotum irrorate on disc. Elytra heavily irrorate, appearing brown in contrast with the yellowish vertex, pronotum, and scutellum.

Female seventh sternite, fig. 426V, with posterior margin produced and margined with brown on either side of a rather broad shallow V-shaped notch. Male plates, fig. 425D, long, gradually tapering to narrow blunt apices. Aedeagus in ventral view rather broad, apical half directed dorsally,

apex with four terminal slender processes; central pair long and forming the terminal portion of the aedeagus, the lateral pair short. A heavy spine-bearing process arising at the apex of each pygofer and extending across to opposite side.

This species occurs in Illinois and Connecticut in the floodplain woods association where tall grasses and dense herbaceous plants are found with cane in shaded areas. This is the only type of habitat in which it has been collected.

**Illinois Record.**—HEROD: Aug. 4, 1934, Mohr & DeLong, 1 ♂, 5 ♀.

### 5. *Paraphlepsius collitus* (Ball)

*Phlepsius collitus* Ball (1903, p. 227).

Length 5.5–6.0 mm. One of the smaller of the yellow-headed group. Vertex a little longer at middle than next to eyes, produced and bluntly angled, margin definite, vertex angled with front. Vertex, pronotum, and scutellum irrorate with pale or yellowish brown and contrasting with the dark brown irrorations on the elytra.

Female seventh sternite, fig. 426D, posteriorly emarginate on either side of a broad median tooth, which is bifid at apex. The entire margin heavily brownish. Male plates, fig. 424A, rather long, broad at bases, concavely narrowed on apical halves to bluntly pointed apices.

This is a common grass-feeding species in meadows and in open woodland habitats, and it occurs from Maine to Florida and west to Iowa. It is widely distributed in Illinois.

**Illinois Records.**—Males and females, taken May 6 to October 3, are from Anna, Billett, Carbondale, Champaign, Cobden, Dixon Springs, Dolson, Effingham, Eichorn, Fulton, Golconda, Grand Tower, Hamburg, Harrisburg, Havana, Herod, High Knob, Hillsboro, Karnak, Lima, Metropolis, Oakwood, Pike, Princeton, Putnam, Shawneetown, Thebes, Urbana, Ursa, and Vienna.

### 6. *Paraphlepsius fulvidorsum* (Fitch)

*Jassus fulvidorsum* Fitch (1851, p. 62).

Length 5.5–6.0 mm. Vertex, pronotum, and scutellum pale fulvous yellow, contrasting with the dark brown elytra. Vertex angulate, one-half longer at middle than next to eyes; margin sharp, acutely angled with front. Female seventh sternite, fig.

426F, with posterior margin incised at middle, forming a pair of median short blunt teeth; margin slightly emarginate between each tooth and lateral angles on each side. Male plates, fig. 424D, long, gradually narrowed from bases to pointed apices.

Although occurring in the eastern states and west to the Rocky Mountains, this species is not abundant but is taken more commonly in small numbers in habitats that are like the heath. It occurs on grasses in both moist and dry areas.

**Illinois Records.**—Males and females, taken July 8 to October 3, are from Anvil Rock, Apple River Canyon State Park, Channel Lake, Dixon Springs, Dolson, Elizabethtown, Fern Cliff, Grand Detour, Herod, Muncie, and Palos Park.

### 7. *Paraphlepsius eburneolus* (Osborn & Lathrop)

*Phlepsius eburneolus* Osborn & Lathrop (1923, p. 331).

Length 5.0–5.25 mm. Vertex light fulvous; pronotum, scutellum, and elytra dark brown. Vertex obtusely angled, one-third longer at middle than next to eyes, apex with a sharp edge, angled with front. Female seventh sternite, fig. 426G, with posterior margin notched at middle, produced, with a pair of blunt teeth; slightly emarginate on either side between each tooth and broadly rounded lateral angle. Male plates, fig. 425A, slightly concave on center of outer margins, each convexly rounded to inner margin at apex, forming a pointed apex.

Apparently this species is found on grasses in woodland areas only. It is apparently not abundant, although taken from Virginia to Minnesota. In Illinois, it has been taken from a woodland habitat.

**Illinois Record.**—DOLSON: July 24, 1936, DeLong & Mohr, 1 ♀.

### 8. *Paraphlepsius latifrons* (Van Duzee)

*Phlepsius latifrons* Van Duzee (1892a, p. 66).

Length 7 mm. Large, robust, with a short broadly rounded head. Vertex slightly longer at middle than next to eyes. Margin thick, obtusely angled, almost rounded to front. Pronotum almost four times as long as vertex. Color pale, heavily marked with brownish irrorations and ramose pigment lines.

Female seventh sternite, fig. 426C, broadly,

angularly excavated, the sides of excavation sinuate. Male plates, fig. 425B, concavely excavated on inner margins just below narrowed rather pointed and convergent apices.

This is a pasture species, recorded previously from the southeastern states, and has never been found abundantly. It occurs in pastures of long standing where there is a variety of herbaceous vegetation.

**Illinois Records.**—CAVE IN ROCK: Oct. 2, 1934, Frison & Ross, 1 ♀. CLAY CITY: at light, June 24, 1909, 1 ♂. DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♂, 1 ♀. GOLCONDA: June 22, 1934, Ross, Dozier, & Park, 1 ♀. SHAWNEETOWN: June 23, 1936, DeLong & Ross, 3 ♂, 3 ♀; June 27, 1936, DeLong & Mohr, 7 ♂, 1 ♀.

### 9. *Paraphlepsius tigrinus* (Ball)

*Phlepsius tigrinus* Ball (1909a, p. 80).

Length 6 mm. Tawny, brown, with faint reticulations, and with a pale spot on yellow scutellum. Vertex short, only slightly longer at middle than next to eyes, margin thick, not sharply angled with front. Female seventh sternite, fig. 426J, with the posterior margin short, roundedly emarginate on either side of a produced median tooth, which is narrowly bifid at middle. Male plates, fig. 424B, concavely narrowed on outer margins at middle, each produced and convexly rounded at apex to form pointed tips on inner margin.

Previously recorded from the District of Columbia and Ohio, this species has been taken in Illinois. It occurs only on pine.

**Illinois Records.**—GIBSONIA: Oct. 2, 1934, Frison & Ross, 1 ♂. OAKWOOD: Aug. 17, 1934, DeLong & Ross, 1 ♂.

### 10. *Paraphlepsius maculosus* (Osborn)

*Phlepsius maculatus* Osborn (1905a, p. 276).

Name preoccupied.

*Phlepsius maculosus* Osborn in Osborn & Lathrop (1923, p. 319). New name.

Fig. 427. Length 7 mm. Broad headed. Vertex short, scarcely longer at middle than next to eyes; margin thick, almost rounded to front. Pale, marked with brown irroration that blend into spotted areas on head, pronotum, and elytra. Four dark spots on anterior margin of vertex and two darker spots next to the posterior border. Female seventh sternite, fig. 426U, long, median three-fourths produced abruptly into a lobe,

the median third of which is notched one-fourth the distance to base by a V-shaped notch with the apex rounded; black spot causes segment to appear more deeply notched. Male plates, fig. 425K, short, inner margins concavely excavated, forming divergent bluntly pointed apices. Pygofer greatly exceeding plates.

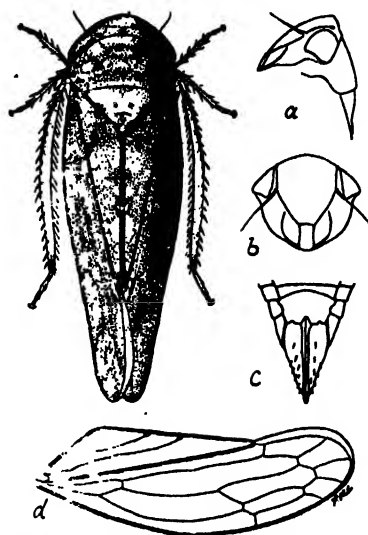


Fig. 427.—*Paraphlepsius maculosus*. Adult: a, profile; b, face; c, female genitalia; d, elytron. (From Osborn.)

This species, described from Ohio, is apparently rare or very difficult to capture. One male was collected in Illinois on a sand prairie that is being invaded by woodland. Records indicate that the species is usually taken in prairie habitats.

**Illinois Record.**—ST. ANNE: July 20, 1934, DeLong & Ross, 1 ♂.

### 11. *Paraphlepsius turpiculus* (Ball)

*Phlepsius turpiculus* Ball (1900b, p. 200).

Length 6–7 mm. Broad headed. Vertex almost parallel margined, but little longer at middle than next to eyes, margin roundedly angulate, bluntly angled with front. Color rather uniformly and evenly irrorate with brownish pigment. Female seventh sternite, fig. 426I, with posterior margin rather deeply and concavely excavated on either side of median half, which is broadly, shallowly, and angularly excavated, with a black mark at apex of excavation suggesting a deep incision. Male plates, fig. 425J, concavely narrowed and tapered to acute apices.

Each pygofer spine directed caudally, sinuate, and lying dorsad to caudal end of pygofer.

For many years we have referred specimens of this species to *fuscipennis*, which is a smaller and darker species and seems to be confined to the Atlantic coastal area; *turpiculus* is a prairie form closely related to *fuscipennis* and occurs in the northern part of Illinois, as well as other parts of the Middle West and the South. It occurs in moist habitats and in prairie lagoons in marshy areas.

**Illinois Records.**—BEACH: July 25, 1934, Frison & DeLong, 2 ♀. NORTHERN ILLINOIS: 1 ♀. OAK LAWN: Sept. 6, 1935, T. H. Frison, 1 ♂. ZION: Aug. 7, 1935, Ross & DeLong, 1 ♀.

## 12. *Paraphlepsius altus* (Osborn & Ball)

*Phlepsius altus* Osborn & Ball (1897, p. 228).

Length 5 mm. Short, robust. Vertex bluntly angulate, about one-fifth longer at middle than next to eyes, margin thick, bluntly angled with front. Rather evenly and densely irrorate with dark fuscous. Female seventh sternite, fig. 426L, with lateral angles strongly produced, between which the posterior margin is broadly, deeply, and abruptly emarginate, the margin of excavation at base forming a rounded black lobe on either side of a median narrow incision. Male plates, fig. 424E, long, slightly and concavely narrowed to acute bluntly pointed apices.

Recorded only from the Middle West, this species is common in the wet prairie and usually does not occur in dry prairie habitats. It has been collected in Illinois from short grasses in low moist prairie habitats.

**Illinois Records.**—FULTON: low pasture, July 8, 1934, DeLong & Ross, 1 ♂, 4 ♀. ZION: Aug. 7, 1935, DeLong & Ross, 1 ♀.

## 13. *Paraphlepsius pusillus* (Baker)

*Phlepsius pusillus* Baker (1893a, p. 66).  
*Phlepsius collinus* Osborn & Lathrop (1923, p. 324).

Length 4.5–5.0 mm. Short, broad, robust. Vertex distinctly angulate, almost one-half longer at middle than next to eyes, margin distinct, angled with front. Vertex, pronotum, and scutellum dark, interspersed with white spots. Elytra marked with dark brown

vermiculate lines. Female seventh sternite, fig. 426H, short, posterior margin broadly, very shallowly emarginate, with a short V-shaped notch at middle; entire margin of excavation heavily embrowned. Male plates, fig. 424J, evenly, slightly, and convexly narrowed to bluntly angled apices.

Recorded previously from the Atlantic states, this is a common hillside pasture species in southern Illinois, where it occurs on short grasses. It seems to be rather definitely restricted to a dry upland habitat.

**Illinois Records.**—ANVIL ROCK: Oct. 3, 1934, Frison & Ross, 1 ♂, 3 ♀. CAVE IN ROCK: Oct. 2, 1934, Frison & Ross, 1 ♂. DIXON SPRINGS: July 29, 1934, DeLong & Mohr, 6 ♂, 2 ♀. FERN CLIFF: Aug. 3, 1934, DeLong & Mohr, 1 ♀. HEROD: Aug. 3, 1934, DeLong & Mohr, 1 ♂, 1 ♀. VIENNA: July 29, 1934, DeLong & Ross, 3 ♂, 7 ♀.

## 14. *Paraphlepsius incisus* (Van Duzee)

*Phlepsius incisus* Van Duzee (1892a, p. 73).

Length 6 mm. Rather broad, robust. Vertex bluntly angled, a little longer at middle than next to eyes, distinctly angled with front, margin definite. Marked with brown irrorations, often appearing whiter along the margin. Female seventh sternite, fig. 426N, with lateral margins sloping to median half of segment, which is rather deeply, broadly, and angularly excavated more than one-third the distance to base, and with a brown spot on either side of notch on outer sloping margin; lateral angles absent. Male plates, fig. 425L, deeply, concavely excavated on outer margins and produced to rather broad blunt rounded apices.

This is a grass-feeding species usually found in open woodland areas and often in rather densely shaded herbaceous growth. It is found in the East and Middle West, and occurs in small numbers in widely separated localities in Illinois.

**Illinois Records.**—ANTIOCH: July 5–7, 1932, T. H. Frison, 1 ♂. APPLE RIVER CANYON STATE PARK: Aug. 22, 1935, DeLong & Ross, 3 ♂. DOLSON: July 18, 1934, DeLong & Ross, 1 ♂, 1 ♀; July 24, 1936, DeLong & Mohr, 1 ♀. SAVANNA: July 19, 1892, McElfresh, Shiga, Forbes, & Hart, 1 ♀. URBANA: July 28, 1889, C. A. Hart, 1 ♀; Aug. 18, 1892, C. A. Hart, 1 ♀; Sept. 5, 1898, C. W. Woodworth, 1 ♀; July 18, 1917, 1 ♂; Aug. 17, 1920, 1 ♂.

15. *Paraphlepsius umbrosus* (Sanders & DeLong)

*Phlepsius umbrosus* Sanders & DeLong (1917, p. 88).

Length 6.0–6.5 mm. Large, rather robust, brownish. Vertex obtusely angled, one-half longer at middle than next to eyes, margin thick, obtusely angled with front; rather densely and evenly irrorate with brown, except for a paler spot each side next to eye. Female seventh sternite, fig. 426O, long, tapered, posterior angles prominent, narrowly rounded. Posterior margin produced, bifid at center, a rounded tooth either side; the margin slightly concave between each median tooth and lateral angle. Male plates, fig. 425F, long, rather narrow, slightly and concavely narrowed on outer margins to bluntly pointed apices. Aedeagus with a narrow straight dorsal process. Body of aedeagus not recurved but straight, a little narrowed before apex.

This species has a northern distribution and is an open woodland form living on herbaceous vegetation in rather definitely shaded areas. It has been taken in northern Illinois.

**Illinois Record.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 1 ♀.

16. *Paraphlepsius lascivius* (Ball)

*Phlepsius lascivius* Ball (1900b, p. 200).  
*Phlepsius micronotatus* Osborn & Lathrop (1923, p. 321).

Length 6 mm. Rather robust, brownish, with the black coloration of the face visible on margin of vertex from above. Vertex bluntly angled, slightly longer at middle than next to eyes, margin thick, obtusely angled with front; densely irrorate with dark brown except for a white spot at apex, on either side of which is a polished black spot formed by the extension of the black coloration on the upper portion of face. Female seventh sternite, fig. 426P, long, posterior margin broadly, very shallowly emarginate, with a slight notch at middle. Male plates, fig. 424E, concavely narrowed on median portion to broadly rounded apices.

This is a western prairie species and may eventually be found in the prairie habitat in Illinois.

17. *Paraphlepsius truncatus* (Van Duzee)

*Phlepsius truncatus* Van Duzee (1892a, p. 72).

Length 5.25–5.5 mm. Narrow, with bluntly angulate head; superficially resembling *irroratus* so closely that the two species cannot be separated except by use of the external genital characters. Vertex about one-fourth longer at middle than next to eyes and bluntly angled with front. Rather uniformly irrorate with brown. Female seventh sternite, fig. 426W, with lateral margins broadly rounded to posterior margin, which is almost truncate, but very slightly emarginate on median third, the emargination black bordered. Male plates, fig. 424C, gradually, slightly, and concavely narrowed to rather broad blunt apices, which are convexly rounded on outer margins to inner margins.

This is a very common and abundant species in the eastern states but is not found in as great numbers as *irroratus*. The optimum habitat seems to be a moist open woodland with dense herbaceous vegetation.

**Illinois Records.**—Many males and females, taken June 13 to October 3, are from Alsip, Alton, Anvil Rock, Barry, Cave in Rock, Dixon Springs, Dolson, Eichorn, Elizabethtown, Fairfield, Fulton, Gibsonia, Grand Tower, Herod, Hillsboro, Homer, Mahomet, Marshall, Metropolis, Momence, Muncie, Norris City, Oak Lawn, Pana, Princeton, Seymour, Shawneetown, Thebes, Urbana, Vienna, Volo, and Watson.

18. *Paraphlepsius irroratus* (Say)

*Jassus irroratus* Say (1831, p. 308).

*Jassus testudinarius* Burmeister (1838, pl. 14).

Length 5.5–6.0 mm. Slender, with a bluntly, angularly produced vertex that is about one-fourth longer at middle than next to eyes; margin rather thick, obtusely angled with front. Coloration somewhat variable, usually rather uniformly and heavily irrorate. Female seventh sternite, fig. 426T, truncate, with a short tooth produced on either side of median third, which is squarely and deeply excavated half way to base; a broad tooth the width of excavation extending half way to posterior margin. Male plates, fig. 424G, concavely narrowed near middle, apices produced as long narrow straplike processes that are blunt at apices.

Transcontinental in distribution, this is

the most common species of the genus and occurs in almost every habitat condition. It is common in pasture, meadow, and wet prairie situations, and occurs upon almost every type of cultivated crop.

**Illinois Records.**—Many males and females, taken May 15 to October 31, are from Adair, Algonquin, Alton, Anvil Rock, Apple River Canyon State Park, Arcola, Atlas, Aurora, Beach, Bradley, Buda, Bushnell, Cairo, Carbondale, Carman, Cave in Rock, Champaign, Charleston, Chemung, Chicago, Clayton, Clay City, Collinsville, Cornland, Danville, Decatur, Deland, Des Plaines, Dolson, Dongola, Dubois, Dwight, Eichorn, Elgin, Elizabethtown, Fairfield, Forrest, Fox Lake, Fulton, Galena, Geff, Gibson City, Gibsonia, Golconda, Grafton, Grand Detour, Grays Lake, Harrisburg, Havana, Herod, High Knob, Hillsboro, Kampsville, Kankakee, Karnak, Lima, Luther, Mahomet, Marshall, Meredosia, Metropolis, Momence, Monmouth, Monticello, Mount Carmel, Muncie, New Holland, Norris City, Oak Lawn, Oakwood, Ogden, Olive Branch, Onarga, Palos Park, Pana, Payson, Pecatonica, Pekin, Pike, Princeton, Pulaski, Putnam, Quincy, Rosiclare, Round Lake, St. Anne, Seymour, Shawneetown, Sheffield, Sibley, Sparta, Springfield, Starved Rock State Park, Sterling, Sumner, Thebes, Temple Hill, Urbana, Ursa, Vandalia, Vienna, Virginia, Volo, Waukegan, White Heath, and Zion.

#### 19. *Paraphlepsius tennesa* (DeLong)

*Phlepsius tennesa* DeLong (1916, p. 75).

*Phlepsius similis* Lathrop (1917, p. 128).

Length 5.5–6.0 mm. Rather large and elongate. Vertex bluntly angled, about one-half longer at middle than next to eyes, forming a rather definite margin with the front. Marked with brownish irrorations, but without definite additional markings. Female seventh sternite, fig. 426R, with posterior margin rather broadly and shallowly emarginate on either side of a median narrowly notched portion; median line cephalad to notch and each emargination brown bordered. Male plates, fig. 424F, gradually, slightly, and concavely narrowed to blunt rounded apices.

This is a common grass-feeding species and is found abundantly in moist or partly shaded habitats. It was reported previously from Ohio and eastward.

**Illinois Records.**—Males and females, taken June 14 to October 2, are from Cache, Carmi, Cave in Rock, Dixon Springs, Dongola, Dolson, Elizabethtown, Fern Cliff, Jonesboro, Karnak, Norris City, Olive Branch, Shawneetown, Temple Hill, and Vienna.

#### 20. *Paraphlepsius brunneus* (DeLong)

*Phlepsius brunneus* DeLong (1916, p. 74).

Length 6–7 mm. Resembling *tennessa* in form and size, but usually darker brown in color. Vertex obtusely angled, about one-half longer at middle than next to eyes, vertex definitely angled with front, margin rather sharp. Rather heavily and evenly irrorate with dark brown pigment. Female seventh sternite, fig. 426K, roundedly narrowed to produced narrow lateral angles, between which the posterior margin is broadly excavated about one-fourth the distance to base; posterior margin of excavation slightly produced at middle and rather deeply and narrowly notched, the concavity on each side of notch dark margined. Male plates, fig. 424I, rather long, concavely tapered to rather blunt pointed apices.

This species is found less commonly than *tennessa* but in similar moist grassy habitats. It was previously reported from Tennessee and the Lake Erie region.

**Illinois Records.**—Males and females, taken June 13 to August 17, are from Dolson, Eichorn, Havana, Herod, Karnak, Metropolis, Norris City, Quincy, St. Joseph, Shawneetown, and Vienna.

#### 21. *Paraphlepsius lobatus* (Osborn)

*Phlepsius lobatus* Osborn (1898, p. 247).

Length 4.5–5.25 mm. Rather elongate, with a bluntly angled vertex, rounded at apex, and a little longer at middle than next to eyes; vertex bluntly angled with front, margin thick. Dorsum rather evenly, but not densely, irrorate with fuscous. Female seventh sternite, fig. 426E, slightly narrowed, lateral angles strongly produced and pointed, between which the posterior margin is abruptly excavated about one-fifth the distance to base, with the margin of excavation slightly and angularly produced and incised at middle. Male plates, fig. 424O, short, concavely narrowed to bluntly pointed apices, which are slightly divergent.

This is an uncommon Middle Western

species that has been collected in moist grassy habitats. It should occur in northern Illinois.

## 22. *Paraphlepsius humidus* (Van Duzee)

*Phlepsius humidus* Van Duzee (1892a, p. 76).  
*Phlepsius dentatus* Baker (1898a, p. 65).

Length 6-7 mm. Large, broad, yellowish brown. Vertex obtusely angled, anterior margin thin, acutely angled with front; vertex and scutellum usually pale yellowish. Elytra with three indistinct transverse bands; a fuscous spot on suture at middle and apex of each clavus. Female seventh sternite, fig. 426Q, short, lateral angles rounded, between which the posterior margin is concavely notched on either side of the median half, which is produced beyond the lateral angles and is bifid at center, producing a pair of pointed teeth; sides of produced portion black margined. Male plates, fig. 424N, rather rapidly narrowed to acutely angled apices.

This species is abundant in the eastern half of the United States in fresh-water marshes and in moist or wet grassy meadow areas. Apparently it lives on coarse grasses or sedges.

**Illinois Records.**—Males and females, taken May 29 to October 5, are from Algonquin, Buda, Champaign, Channel Lake, Dubois, Grand Detour, Hamilton, Havana, Herod, Homer, Keithsburg, Lake Villa, Macomb, McHenry, Muncie, Oquawka, Princeton, Spring Valley, Sugar Grove, Sun Lake, Urbana, and Volo.

## 23. *Paraphlepsius ramosus* Baker

*Paraphlepsius ramosus* Baker (1897, p. 158).  
*Phlepsius tenuifrons* Sanders & DeLong (1919, p. 235).

Length 7 mm. Large, robust, with a thin-margined almost foliaceous vertex, which is roundedly angulate; margin sometimes definitely upturned. Dark brown to fuscous, elytra with fuscous marking more dense posterior to middle, producing a banded appearance. Female seventh sternite, fig. 426M, long, appearing almost truncate, posterior margin slightly notched at middle, the margin between notches sinuate. Male plates, fig. 425E, long, concavely narrowed near middle on outer margins, then produced, forming bluntly pointed apices.

This northeastern species occurs on tall

grasses or sedges in fresh-water marshes, and on coarse grasses in low wet meadows. It has not been found on the prairies.

**Illinois Records.**—CHAMPAIGN: at light, July 27, 1887, C. A. Hart, 1 ♂. DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 1 ♂, 1 ♀. MUNCIE: sweeping, July 25, 1908, 1 ♀; Aug. 15, 1917, 1 ♀. URBANA: sweeping, June 21, 1889, C. A. Hart, 1 ♂.

## 24. *Paraphlepsius bifidus* (Sanders & DeLong)

*Phlepsius bifidus* Sanders & DeLong (1917, p. 89).

Length 7 mm. Large, rather robust. Vertex roundedly angulate, about one-third longer at middle than next to eyes, flattened, margin acute, thin, sharpest at middle. Color dark gray, vertex yellowish, pronotum yellowish on anterior margin, disc darker. Scutellum ivory white, with sparse irrorations. Elytra marked with brown pigment, darker on posterior half, and with indication of a paler band at middle. Female seventh sternite, fig. 426Y, tapered to apex and sloping to prominent angles, between which the brownish posterior margin is deeply and angularly notched two-thirds the distance to base. Male plates, fig. 424M, long, broad at base, slightly and concavely narrowed near middle, and together produced to form a rather bluntly pointed apex. Pygofers with dorsal pointed processes.

This species has a northern distribution and is a woodland form. It may occur in northern Illinois.

## 25. *Paraphlepsius solidaginis* (Walker)

*Acocephalus solidaginis* Walker (1851a, p. 847).

*Phlepsius nebulosus* Van Duzee (1892a, p. 77).

Length 8 mm. This is probably the largest species of the genus. Vertex roundedly angulate, nearly twice as long at middle as next to eyes, margin sharp, acutely angled with front. Color grayish brown, the paler brown color often caused by the more sparse irrorations or ramose markings. Female seventh sternite, fig. 426S, tapered to apex, lateral angles produced and prominent, between which the posterior margin is broadly, decidedly emarginate; border of emargination practically truncate and slightly notched at middle, black margined. Male plates, fig. 425H, long, concavely narrowed near mid-



dle of outer margins, then produced to bluntly pointed apices.

This is a typical species of the moist prairie in the eastern states and west to Colorado. It is found also in meadows that are similar to the moist prairies.

**Illinois Records.**—BEACH: Aug. 22, 1906, 1♂. CHAMPAIGN: July 6, 1887, C. A. Hart, 1♀. FOX LAKE: Aug. 6, 1935, DeLong & Ross, 1♂. GALESBURG: 1♀. HOMER: at light, July 11, 1927, Frison & Glasgow, 1♀. PRINCETON: July 12, 1937, Mohr & Burks, 1♂. ZION: July 25, 1935, Frison & DeLong, 1♂, 1♀; Aug. 7, 1935, Ross & DeLong, 1♀.

## 26. *Paraphlepsius certus* (DeLong)

*Phlepsius certus* DeLong (1938b, p. 44).

Length 5.5 mm. Slender, brownish; in size, form, and color similar to *irroratus*, but differing in male genital structures. Vertex evenly marked with brown ramose pigment. Two darker spots on each elytron, one at end of claval suture and another about half way between this and apex of scutellum. Male plates, fig. 424H, long, slightly and concavely narrowed about half way to apices, which are bluntly pointed. Aedeagus in lateral view curved upward near base, then bifurcate, a short process extending dorsally, and a broad longer process directed caudally, the latter narrowed near apex. A long dorsally directed spine at the ventrocaudal margin of each pygofer. Female unknown.

This species has been collected only in a fresh-water marsh in Wisconsin.

## 27. *Paraphlepsius electus* (DeLong)

*Phlepsius electus* DeLong (1938b, p. 43).

Length 5 mm. In size and form similar to *irroratus*, but paler in color. Vertex bluntly angled, one-half longer at middle than next to eyes, margin rather thin, sharply angled with front. Vertex, pronotum, and scutellum cream colored, rather evenly irrorate with light brown. Elytra irrorate with darker brown.

Male plates, fig. 424K, about as long as combined width at base, gradually tapered to blunt apices. Aedeagus with a ventral and dorsal portion; ventral portion in lateral view narrow at base, strongly and abruptly broadened on apical third with a short dorsal process at apex; dorsal process curved

dorsally at base, then posteriorly, consisting of two lateral pieces that diverge at apex and exceed the ventral portion in length. Each pygofer with a short erect spine on dorsal apical margin.

This species is known only from Illinois and Missouri.

**Illinois Record.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, Frison & DeLong, 1♂.

## 86. *TEXANANUS* Ball

*Texananus* Ball (1918, p. 384).

Head narrower than pronotum. Vertex bluntly angular, sometimes conical, vertex with margin rounded to front. Elytra broad and short.

About 30 species of this genus are recorded from the United States; six of them occur in Illinois. Several others may eventually be found here.

### KEY TO SPECIES

1. Females.....2  
Males.....7
2. Seventh sternite, fig. 428A, roundedly produced from base to apex, with two rounded teeth. Length 7.0–7.25 mm.....1. *rufusculus*  
Seventh sternite concavely rounded or notched.....3
3. Seventh sternite broadly and concavely excavated from lateral angles.....4  
Seventh sternite with median half of posterior margin notched or excavated.....5
4. Seventh sternite, fig. 428C, excavated half way to base, not exposing lateral margins of underlying membrane.....2. *superbus*  
Seventh sternite, fig. 428B, deeply excavated two-thirds the distance to base, exposing lateral lobes of underlying segment at the sides.....3. *excultus*
5. Seventh sternite, fig. 428D, with posterior margin shallowly and angularly sloping to median narrow short V-shaped notch; entire insect tessellate.....4. *areolatus*  
Seventh sternite deeply notched at least half way to base; insect not tessellate.....6
6. Seventh sternite, fig. 428E, notched more than half way to base, notch abruptly narrowed half of its way to base, apex rounded.....5. *decorus*  
Seventh sternite, fig. 428F, with a broad V-shaped notch, and a narrow rather deep rounded emargination on margin on either side of notch.....6. *cumulatus*
7. Plates broad, short, rounded, together almost semicircular in shape, as in fig. 428G.....8  
Plates bluntly or rather sharply angled, as in fig. 428H.....9

8. Entire insect tessellate; each pygofer, fig. 428G, as broad as long, truncate caudally; aedeagus composed of one process.....4. *areolatus*  
Insect brown, not tessellate; each pygofer, fig. 428J, more than twice as long as greatest width, concavely narrow to pointed caudal apex; aedeagus with a rounded dorsal process and a long straight ventral process....2. *superbus*
9. Reddish brown in color; length 7.0 mm. or more.....1. *rufusculus*  
Usually darker brown in color; length less than 6.5 mm.....10
10. Plates, fig. 428H, triangular, together acutely pointed; aedeagus composed of one process.....3. *excultus*  
Plates with apices rounded, blunt; aedeagus with two processes, a long straight ventral process and a dorsal curved process.....11
11. Plates, fig. 428L, short and narrow; pygofer pointed caudally; dorsal process of aedeagus long and slender; elytra marked with pale lobate spots.....5. *decorus*  
Plates, fig. 428I, longer and broader, pygofer blunt, rounded caudally; dorsal process of aedeagus short and broad; elytra brown, without lobate spots....6. *cumulatus*

### 1. *Texananus rufusculus* (Osborn & Lathrop)

*Phlepsius rufusculus* Osborn & Lathrop (1923, p. 340).

Length 7.0-7.25 mm. Large, robust, resembling *superbus* but larger and more reddish brown in color. Vertex one-fourth longer at middle than next to eyes, obtusely rounded to front; anterior border of vertex ivory yellow. Female seventh sternite, fig. 428A, broadly and roundedly produced from base to form a pair of short broadly rounded teeth separated by a narrow notch. Male plates, fig. 428K, rather long, triangular with bluntly pointed apices. Aedeagus with a pair of ventral lateral processes, which are divergent, and a median process, which is enlarged at the base and abruptly tapered to a long slender process.

This uncommon species has been collected only in wooded floodplain areas, and its range of habitat is not known. It was previously recorded from Ohio and Missouri.

**Illinois Record.**—MAKANDA: March 27, 1935; Ross & Mohr, 1 ♀.

### 2. *Texananus superbus* (Van Duzee)

*Phlepsius superbus* Van Duzee (1892a, p. 81).

Length 6 mm. Broad, narrow headed, robust, rather heavily irrorate, dark fuscous.

Vertex roundedly angulate, about one-third longer at middle than next to eyes, rounding to front. Female seventh sternite, fig. 428C, broadly excavated half way to base; apex of emargination occupies about one-third of entire width between lateral angles and is truncate; side margins sinuate. Male plates, fig. 428J, short, broad, together semicircular. Aedeagus with a pair of long ventral processes that are abruptly narrowed on dorsal margin near apex and produced in narrow pointed apices; dorsal process short, sickle shaped, with the curved apex directed dorsally and anteriorly. Each pygofer long, tapered, concavely narrowed on ventral margin to rather pointed apex.

This is a transcontinental grass-feeding species and occurs in meadows and pastures.

**Illinois Records.**—ANNA: Oct. 11, 1934, DeLong & Ross, 1 ♂. DIXON SPRINGS: July 29, 1934, DeLong & Ross, 16 ♂, 12 ♀; July 9, 1935, DeLong & Ross, 1 ♂.

### 3. *Texananus excultus* (Uhler)

*Jassus excultus* Uhler (1877, p. 467).

Length 6.0-6.5 mm. Broad, resembling *superbus* in general form and size, but the vertex, pronotum, and scutellum are tawny yellow in contrast to the darker brownish elytra. Commissural line of elytra with white lobate spots. Vertex about one-fourth longer at middle than next to eyes, rounded to front. Female seventh sternite, fig. 428B, broadly excavated two-thirds the distance to base; side margins slightly produced and rounded not far from the lateral margins; plates of underlying sternite exposed at sides of the excavation. Male plates, fig. 428H, broad, triangular, apices bluntly pointed. Aedeagus with a basal dorsally produced process that is tapered and bluntly pointed; apical portion narrowed, tapered to a slender pointed apex, which is dorsally curved anteriorly, almost touching the basal portion. Pygofer short and pointed, not exceeding plates.

This species is southern in range, feeding on grasses in pastures and in wet areas and prairies.

**Illinois Records.**—CAVE IN ROCK: Oct. 2, 1934, Frison & Ross, 1 ♂, 1 ♀. FERN CLIFF: Aug. 3, 1934, DeLong & Mohr, 2 ♂, 3 ♀. GIBSONIA: Oct. 2, 1934, Frison & Ross, 20 ♂, 12 ♀. KARNAK: Aug. 8, 1934, Ross, DeLong, & Mohr, 1 ♀. MAKANDA: March 26, 1935, Ross & Mohr, 1 ♀. NORRIS CITY:

Oct. 1, 1934, Frison & Ross, 1 ♂. VIENNA:  
June 29, 1934, DeLong & Ross, 8 ♀.

4. *Texananus areolatus* (Baker)

*Phlepsioides areolatus* Baker (1898b, p. 30).

Length 6 mm. Ivory white, tessellate with brown, fuscous, and black. Vertex one-third longer at middle than next to eyes. Anterior margin sharp, with alternate ivory and black spots; front straight in profile. Irrorations of elytra often forming definite areolar spots. Female seventh sternite, fig. 428D, rather long; posterior margin broadly and shallowly emarginate, a short V-shaped

notch at apex, a brown spot on either side. Male plates, fig. 428G, short, broad, rounded, almost semicircular. Aedeagus composed of a structure that is enlarged dorsally near base and produced, bearing a narrowed anteriorly curved dorsal process; a long ventral process produced ventrally. Pygofers short, broadly truncate.

Recorded previously only from Kansas, this is a typical prairie species and apparently is restricted to the prairie habitat in Illinois.

Illinois Records.—CARMAN: July 29, 1936, Mohr & Burks, 2 ♂, 5 ♀; July 13, 1937, Mohr & Burks, 13 ♂, 10 ♀.

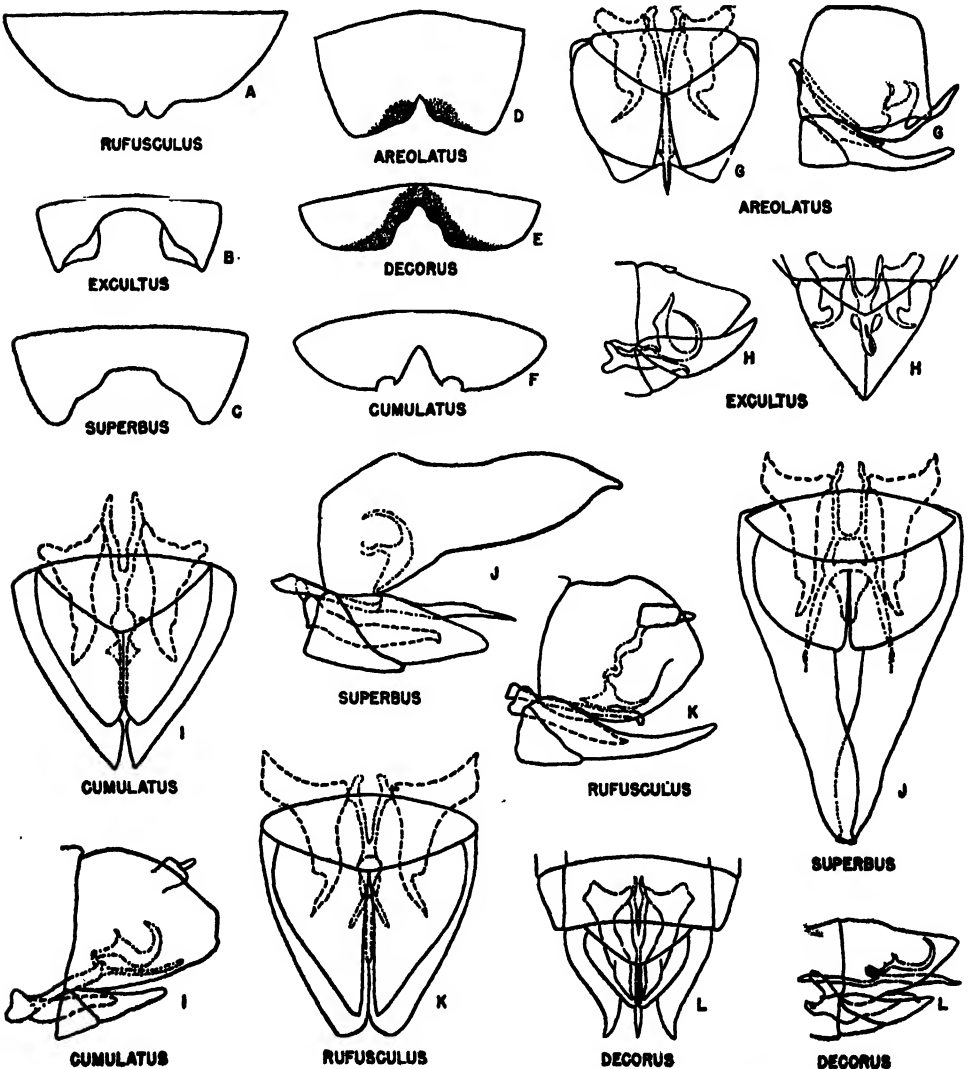


Fig. 428.—*Texananus*. A-F, female seventh sternite; G-L, male genitalia, ventral and lateral aspects.

### 5. *Texananus decorus* (Osborn & Ball)

*Phlepsius decorus* Osborn & Ball (1897, p. 230).

Length 6 mm. Rather short, robust, whitish, with flaring elytra. Vertex broadly, roundedly angulate, about one-third longer at middle than next to eyes; anterior margin bluntly angled. Vertex, pronotum, and scutellum marked with tawny; a transverse pale band on vertex extended forward to apex at middle. Elytral commissural line on clavus with ivory white lobate spots.

Female seventh sternite, fig. 428E, with lateral margins rounded to posterior margin, which is almost truncate; median fourth broadly, deeply, triangularly excavated two-thirds the distance to the base; sides of excavation sinuate. Male plates, fig. 428L, short and narrow, triangular apices roundedly angled. Aedeagus with a long slender bladeliike ventral process, and a rather long slender dorsal process with apical third curved dorsally. Pygofers each tapered to a bluntly pointed apex, these widely divergent and excavated laterally.

Throughout Illinois this is a rather common grass-feeding pasture species in moist habitats. It is also found on certain types of prairie. It occurs widely over the eastern United States.

**Illinois Records.**—Males and females, taken June 14 to October 20, are from Alton, Browns, Cairo, Cave in Rock, Cypress, Dubois, Duncans Mills, Elizabethtown, Farina, Fern Cliff, Gibsonia, Golconda, Grand Tower, Havana, Homer, Jonesboro, Marshall, Muncie, Shawneetown, Urbana, Vienna, and Watson.

### 6. *Texananus cumulatus* (Ball)

*Phlepsius cumulatus* Ball (1900b, p. 202).

Length 6.0–6.5 mm. Broadly oval, robust, reddish brown. Vertex short, scarcely longer at middle than next to eyes; faintly angulate, bluntly rounded to front. The brownish color is distinctly tinged with red. Female seventh sternite, fig. 428F, roundedly produced from base to a narrow rather shallow emargination on either side of a broad V-shaped notch, which extends half way to base. Male plates, fig. 428I, rather short, triangular, with bluntly pointed apices. Aedeagus with a rather long slender ventral process and a dorsal process that is rather broad at base, narrowed apically, and curved

dorsally. Pygofers short and with apices bluntly rounded.

As far as known, this species feeds only on the bearberry, *Arctostaphylos*, and is abundant upon that plant on the sandy areas along the shores of Lake Michigan. It is recorded only from the Middle West and Washington.

**Illinois Records.**—BEACH: Aug. 24, 1906, 1 ♂, 1 ♀; July 25, 1934, Frison & DeLong, 1 ♂, 1 ♀. ZION: July 25, 1934, Frison & DeLong, 74 ♂, 63 ♀; Aug. 7, 1935, Ross & DeLong, 7 ♂, 4 ♀.

### 87. *IOWANUS* Ball

*Iowanus* Ball (1918, p. 382).

The head is unusually narrowed, about three-fourths as wide as pronotum, and the anterior lateral margins of the pronotum slope strongly to the eyes. Individuals in the genus are large, 8–10 mm. in length, and the elytra are elongated. The male genitalia are distinct from those of *Texananus*. They can be recognized from the external view by rounded apical pygofer lobes, each of which is usually set off from the pygofer proper by a ventral and a dorsal notch. The female seventh sternite is almost truncate and with a narrow deep median incision.

The species of the genus are known to occur throughout the eastern half of the United States, in Texas, New Mexico, and as far south as the state of Guerrero in Mexico. They resemble each other very closely, but can be distinguished by the differences in genital structures. DeLong (1939b) records five species for the United States, and four of these have been taken in Illinois. The fifth species is known only from New Mexico.

#### KEY TO SPECIES

1. Females.....2  
Males.....3
2. Female seventh sternite with median notch appearing U-shaped, extending halfway to base; teeth on each side of median notch long, slender.....  
.....3. *borrori*  
Median notch narrowly V-shaped and teeth on each side of median notch blunt, fig. 429C.....  
.....1. *majestus*, 4. *caducus*
3. Apex of each fork of ventral portion of aedeagus, fig. 431, bifid...2. *dicentrus*  
Apex of each fork of ventral portion of aedeagus pointed, as in fig. 430.....4

4. Ventral portion of aedeagus, fig. 430, bent sharply ventrally and produced apically for more than one-third its length.....

### 3. *borrori*

Ventral portion of the aedeagus with the apical portion not sharply bent ventrally, or, if bent, then apical portion very short.....

5. Apical pygofer lobes, fig. 432, appearing short in lateral view, bent inwardly, not constricted basally; apical branches of ventral aedeagus slender, elongate, in lateral view appearing bent twice.....

### 4. *caducus*

Apical pygofer lobes, fig. 429, elongate, ovate, constricted at base; apical branches of ventral portion of aedeagus, short, thick, and curved ventrally.....

### 1. *majestus*

## 1. *Iowanus majestus* (Osborn & Ball)

*Phlepsius majestus* Osborn & Ball (1897, p. 229).

Length 9–10 mm. Large, broadheaded. Vertex about twice as wide as long, bluntly angled, yellowish, with two approximate dots near apex; a broad black band between anterior halves of eyes, with a straight margin in front, and emarginate on either side of the middle behind and often interrupted at middle.

Seventh sternite of female, fig. 429C, broad, lateral margins almost straight, posterior margin shallowly emarginate on either side of two large divergent acute teeth, which are produced beyond the lateral angles; between these teeth is a deep notch extending one-third the distance to base. Male pygofers, figs. 429A, 429B, each with elongate oval apical lobe, which is constricted at base. Ventral portion of aedeagus cleft at apex, forming two processes that are tapered and curved ventrally for a short distance at tip; dorsal portion of aedeagus with a long slender apical process that curves dorsally and extends almost to dorsal wall of joined pygofers; basal lobe shorter, pointed on caudal margin, and gradually broadened to base by the sloping anterior margin, which reaches base of dorsal portion; apical two-thirds of styles almost parallel margined, scarcely notched before outwardly bent blunt apices. Plates gradually narrowed to bluntly pointed apices.

This is a common species on herbaceous plants in shaded wooded areas. It is found in the East and Middle West.

Illinois Records.—WHITE HEATH: Nov. 13, 1937, J. C. Dirks, 1♀. WHITE

PINES FOREST STATE PARK: July 12, 1934, DeLong & Ross, 4 nymphs.

## 2. *Iowanus dicentrus* (DeLong)

*Texananus dicentrus* DeLong (1939b, p. 236).

Length 8.5 mm. Resembling *majestus* in general form, appearance, and coloration. Vertex bluntly, angularly produced, three-fifths as long at middle as width between eyes; a pair of conspicuous dark spots just above apex; transverse dark band between eyes interrupted at middle, forming a right angled triangular spot on either side, with the base along median line. Pronotum with dark median vermiculate markings just back of vertex.

Male plates, figs. 431A, 431B, long, narrowed to bluntly rounded apices. Pygofers shorter than plates; the caudal lobe of each pygofer elongate and narrow. Ventral portion of the aedeagus forked for about one-fourth of its length at apex, each branch conspicuously bifid at apex, bearing a prominent dorsal and a ventral tooth; dorsal portion of the aedeagus composed of a long slender process that curves caudally and then dorsally almost to the dorsal wall of the joined pygofers, also a shorter dorsal process arising at the base and tapered to a blunt apex. Female unknown.

This species is known only from one male, which was collected in Illinois.

Illinois Record.—FERN CLIFF: Aug. 3, 1934, Mohr & DeLong, 1♂.

## 3. *Iowanus borrori* (DeLong)

*Texananus borrori* DeLong (1939b, p. 237).

Length 9.5 mm. Resembling *majestus* in form and coloration but with bent terminal processes of aedeagus, which are more than one-third as long as basal portion; it also differs by having a long terminal lobe on each pygofer. Vertex broadly, bluntly produced, almost twice as wide between eyes as median length; dark spots on vertex above apex faint; transverse band between eyes dark, broad, interrupted at middle, and each portion broadened at both ends, the end next to either eye bifid. Pronotum with the darker markings on anterior half.

Female seventh sternite with prominent rounded lateral angles, between which the posterior margin is concavely rounded on either side of a rather long sharp-pointed

tooth produced on each side of a U-shaped notch, the notch extending half way to the base of sternite. Male plates, figs. 430A, 430B, long and slender, as long as pygofer. Each pygofer bearing a long rather broad caudal lobe; ventral portion of pygofer short and robust. The apical third of aedeagus bent abruptly ventrally, cleft, and forming two long apical widely separated spines; dorsal portion with a long slender curved process from which arises an elongate dorsal process at base.

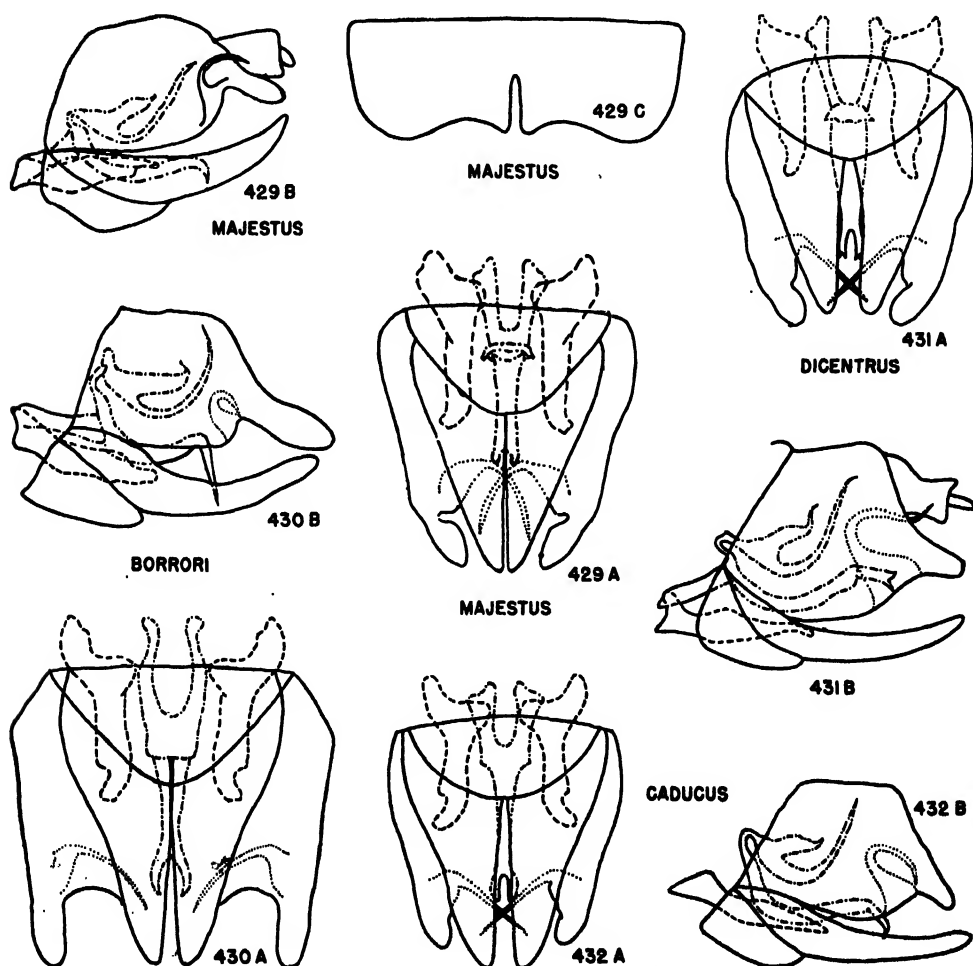
This species is known only from Illinois, Ohio, Wisconsin, and Minnesota. It occurs on rather shaded herbaceous growth in woodland areas.

**Illinois Record.**—WESTERN SPRINGS: Aug. 16, 1935, G. T. Riegel, 1 ♂.

#### 4. *Iowanus caducus* (DeLong)

*Texananus caducus* DeLong (1939b, p. 238).

Length of male 8.0 mm.; female 9.0–9.5 mm. In form and coloration resembling *majestus* but with apical lobe of each pygofer short, blunt, and not indented dorsally or ventrally at base. Vertex broadly, bluntly produced, more than half as long at middle as basal width between the eyes; two small brown spots above apex; transverse band on disc decidedly interrupted at middle, forming a short band either side, the end next to each eye widely bifurcate, the middle portion narrowed, and the portion next to the middle line greatly enlarged caudally. Pronotum heavily infuscated on anterior margin.



Figs. 429–432.—*Iowanus*. A, ventral aspect of male genitalia; B, lateral aspect of male genitalia; C, female seventh sternite.

Female seventh sternite closely similar to that of *majestus* and having a slightly produced blunt tooth on either side of a rather narrow U-shaped notch reaching one-third the distance to the base. Male plates, figs. 432A, 432B, long, tapered to rather narrow rounded apices exceeding pygofer in length. Pygofer with very short rounded caudal lobes, which are not constricted or notched at base. Ventral portion of aedeagus long, apical fourth bent abruptly ventrally and cleft, forming two apical processes, which are each more slender than basal aedeagus body, and they are separated; dorsal portion of aedeagus with a long curved slender ventral process, from the base of which arises a short broader dorsal process.

Recorded from Oklahoma, Tennessee, and Illinois, this is a woodland species occurring on herbaceous vegetation. It is uncommon in Illinois.

**Illinois Records.**—HIGH KNOB: Oct. 3, 1934, Frison & Ross, 1 ♂. ANVIL ROCK: Oct. 3, 1934, 1 ♂, 2 ♀, Frison & Ross. HAVANA: Nov. 8, 1912, 1 ♀; Aug. 8, 1934, Frison & Mohr, 2 ♂, 1 ♀. FERN CLIFF: Aug. 3, 1934, Frison, Ross, Mohr, & DeLong, 1 ♂.

## 88. *FIEBERIELLA* Signoret

*Fieberiella* Signoret (1880, p. 67).

Figs. 223, 239D. Broad, robust, vertex flat, more than one-half again as wide between eyes as median length; anterior margin sharp, acutely angled with front. Face almost as broad as long. Elytra broad, opaque, flaring at tip.

This genus contains a single North American species, apparently imported from Europe.

### 1. *Fieberiella florii* (Stål)

*Selenocephalus florii* Stål (1864, p. 67).

*Phlepsius atropunctatus* DeLong (1923, p. 131).

Length 7.0–7.2 mm. Dull yellowish, densely irrorate with minute round black spots. Face with two heavy black bands sometimes fused just below vertex margin. Female venter milky white, seventh sternite and pygofer brownish, marked with black spots. Vertex flat, one-half to two-thirds wider between eyes than median length, a little shorter than pronotum, anterior edge sharp.

Female seventh sternite three and one-

half times the length of preceding; side margins strongly curved, covering lateral plates; lateral angles rounded and prominent; posterior margin sinuately concave, with a central shallow notch. Male plates, fig. 243, longer than combined width at base, rather broad, gradually narrowed two-thirds their length, then suddenly constricted and produced; plates greatly exceeded by pygofer, which are keeled at middle.

Known from Connecticut and Illinois, this is a rather common species on shrubs and has been taken from ornamental plantings on the University of Illinois campus, at private homes, and in park areas.

**Illinois Records.**—ALTON: July 27, 1934, DeLong & Ross, 1 ♂. URBANA: Aug. 8, 1932, 1 ♀; July 29, 1934, T. H. Frison, 4 ♀; Aug. 12, 1934, T. H. Frison, 1 ♂, 2 ♀; Aug. 16, 1934, DeLong & Ross, 1 ♂; Sept. 16, 1935, DeLong & Ross, 1 ♀.

## 89. *ACINOPTERUS* Van Duzee

*Acinopterus* Van Duzee (1892d, p. 307).

Fig. 212. Head narrower than pronotum, somewhat produced. Pronotum broad and rather short, anterior edge arcuate, sides long. Each elytron narrow, without appendix, apex sharply angled; nervures strong.

Beamer & Lawson (1938) record 26 species and varieties for the United States. All are western in distribution, but one species, *acuminatus*, is also found in the East. It occurs in Illinois.

### 1. *Acinopterus acuminatus* Van Duzee

*Acinopterus acuminatus* Van Duzee (1892d, p. 308).

Length 5.0–6.5 mm. Varying in color from dull brown to green or yellow, with a sharp-pointed apex at each elytron. Head pale, pronotum variable, usually darker. Elytra fulvous, apex of each dark, nervures pale, often with disc of costa and discal areoles of corium whitish, hyaline; claval suture brown. Vertex short, convex. Female seventh sternite moderately long, posterior margin with a shallow median notch, lateral lobes broadly rounded. Male plates long and narrow, pygofer twice length of plates.

Transcontinental in distribution, this is a very abundant species on grasses and herbaceous plants in pastures, meadows, and wooded areas.

**Illinois Records.**—Many males and females, taken June 5 to September 27, are from Anvil Rock, Cave in Rock, Danville, Dixon Springs, Dubois, Eichorn, Elizabethtown, Equality, Fairfield, Golconda, Grand Tower, Hardin, Havana, Karnak, Keithsburg, La Rue, Marshall, Meredosia, Monticello, Muncie, Oquawka, Pike, Ripley, Rosiclare, St. Anne, Shawneetown, Ursa, Vienna, and White Heath.

**90. BANDARA** Ball

*Bandara* Ball (1931a, p. 93).

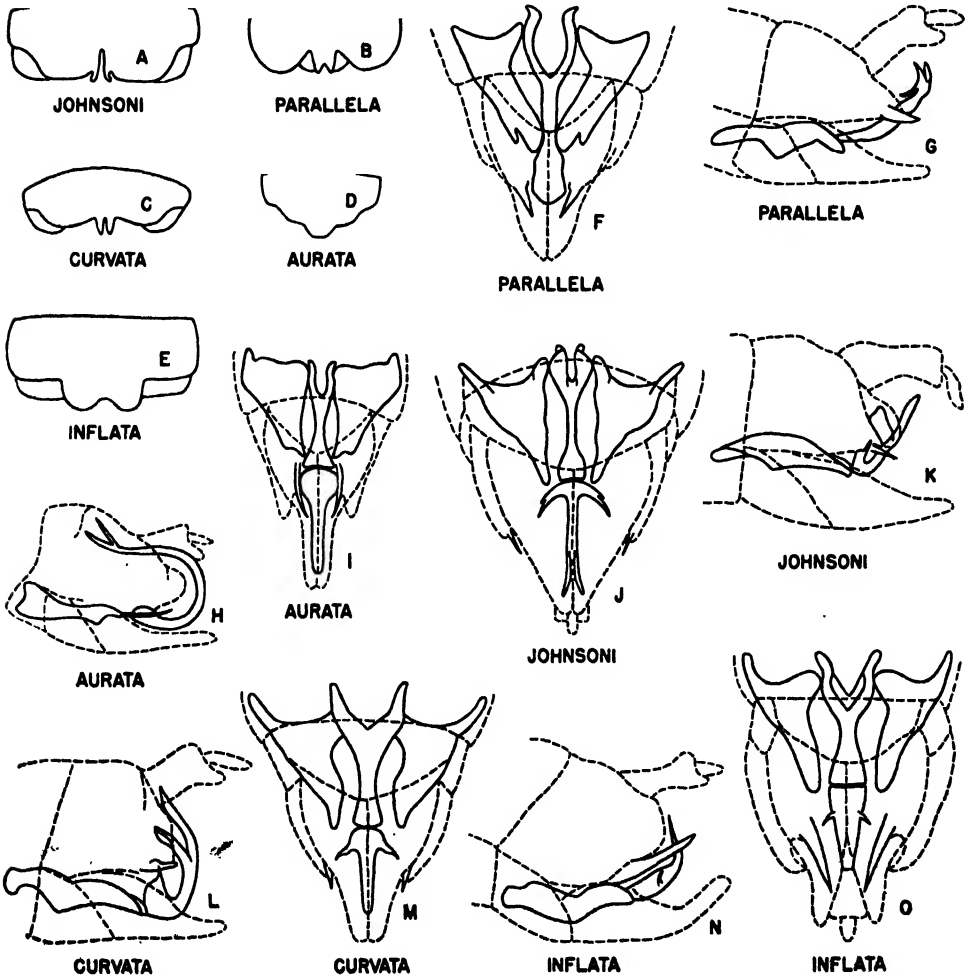
Vertex almost flat, wider than long, margins nearly parallel, anterior margin thick and unusually accentuated by markings above and below; vertex definitely angled

with front. There is sometimes a second cross nervure between the sectors of the elytra.

Six species are included in this genus by Knull (1946); five of them occurring east of the Great Plains region, and the sixth, *animana* (Ball), is known only from Colorado. Two are known from Illinois and the three additional eastern ones may be looked for in future collecting.

**KEY TO SPECIES**

1. Elytra unicolorous, without spots.....**5. aurata**  
Elytra with round or oval pale spots....2
2. Males.....3  
Females.....6
3. Aedeagus having a large preapical dorsal process, partly membranous, both proc-



**Fig. 433.**—*Bandara*: A-E, female seventh sternite; F-O, ventral and lateral views of male genitalia. (Adapted from Knull.)



- ess and apex broad, the latter cleft at tip, fig. 433M.....2. *curvata*  
 Aedeagus having small processes or none at apex, fig. 433J.....4
4. Base of aedeagus with long lateral processes, fig. 433J; pygofer process slender and minute.....1. *johnsoni*  
 Base of aedeagus with short lateral processes, fig. 433O, or none; pygofer process stout.....5
5. Tip of aedeagus straight and simple; pygofer process nearly as long as apical segment of aedeagus, fig. 433O.....3. *inflata*  
 Tip of aedeagus curved, subdivided into small processes; pygofer process short, less than a fourth as long as apical segment of aedeagus, fig. 433F.....4. *parallela*
6. Apex of seventh sternite having a pair of small, finger-like lobes, figs. 433A and 433C.....7  
 Apex of seventh sternite having broad lobes or only a shallow emargination, figs. 433B and 433E.....8
7. Apical "fingers" of seventh sternite separated by an incision over twice as deep as the length of the finger, fig. 433A.....1. *johnsoni*  
 Mesal incision of seventh sternite no deeper than length of "fingers," fig. 433C.....2. *curvata*
8. Seventh sternite having a broad, emarginate mesal process, fig. 433E.....3. *inflata*  
 Seventh sternite having a narrow, emarginate mesal process, fig. 433B.....4. *parallela*

### 1. *Bandara johnsoni* (Van Duzee)

*Eutettix johnsoni* Van Duzee (1894a, p. 137).

Length 4.8–5.2 mm. Orange yellow, with six black dashes above margin of vertex and an interrupted line beneath; posterior margin of vertex, three stripes on pronotum, and numerous oval spots on the elytra milky white. Corium without supernumerary veinlets. Female seventh sternite, fig. 433A, narrowed at half its length and produced to a roundedly emarginate posterior margin, which is rather deeply, narrowly incised at middle to a slightly produced tooth on either side of incision on posterior margin. Male plates, fig. 433J, convexly narrowed to bluntly pointed produced apices. Aedeagus in ventral view, fig. 433J, curved at base, forming a spine on each outer margin; shaft bifid at apex. In lateral view, fig. 433K, a broad dorsal projection arises near middle and extends back even with base. Styles broad at base, short, tapered to slender pointed apices.

This species occurs in the eastern states and is known to extend as far west as

Ohio. It may be found in Illinois with additional collecting.

### 2. *Bandara curvata* Knull

*Bandara curvata* Knull (1946, p. 260).

Length 4.5–5.0 mm. Resembling *johnsoni* in general appearance and color pattern. A dark line just beneath vertex margin and six dark spots just above. Pronotum with three longitudinal white vittae, and elytra with white areolar spots as in *johnsoni*. Female seventh sternite, fig. 433C, rounded on lateral angles; posterior margin slightly emarginate, a pair of short proximal teeth at middle. Male plates tapered to blunt rounded apices. Styles rather long, apices narrow, blunt. Aedeagus, fig. 433M, broad at base; in lateral view, fig. 433L, it extends dorsally and curves anteriorly, apex bifid with the two portions usually appressed; a process arises at about the middle on the dorsoanterior margin and curves dorsally and anteriorly.

This species occurs on herbaceous or shrubby vegetation in open woodland in the eastern United States and west to Iowa.

**Illinois Records.**—APPLE RIVER CAN-  
 YON STATE PARK: July 11, 1934, DeLong & Ross, 1 ♀. DONGOLA: Aug. 23, 1916, 1 ♀. DUBOIS: Aug. 8–9, 1917, 3 ♀. ST. JOSEPH: July 30, 1934, T. H. Frison, Jr., 1 ♀. SHAWNEETOWN: June 27, 1936, DeLong & Mohr, 1 ♀. URBANA: Aug. 9, 1920, J. R. Malloch, 1 ♂. VIENNA: June 14, 1934, DeLong & Ross 2 ♂, 1 ♀.

### 3. *Bandara inflata* Knull

*Bandara inflata* Knull (1946, p. 262).

Length 5.0–5.5 mm. In general appearance and color pattern resembling *johnsoni* but usually more orange in color. Female seventh sternite, fig. 433E, short, truncate, median third abruptly produced, forming a broad lobe which is broadly, shallowly indented at middle. Male styles, fig. 433O, narrowed at apices, blunt and divergent, gradually narrowed from bases to rather broad blunt rounded apices. Aedeagus, fig. 433N, curved dorsally, apex divided, forming two divergent attenuate spines; a pair of short spines arise near base on lateral margins.

This species has been recorded from Ohio and North Carolina, and may eventually be found in Illinois.

#### 4. *Bandara parallela* Knull

*Bandara parallela* Knull (1946, p. 263).

Length 4.2–5.0 mm. Resembling *curvata* in general form, color, and appearance, but usually darker in color. Female seventh sternite, fig. 433B, with rounded lobelike lateral angles between which the posterior margin is broadly, rather deeply emarginate, with a broad short spatulate process at its apex; process slightly notched at apex and produced to same length as lateral angles. Male plates, fig. 433F, long, convexly rounded to blunt appressed apices. Styles elongate, with broad blunt rounded apices. Aedeagus, fig. 433G, curved dorsally, with two pairs of lateral processes arising near apex.

This is a common species in the eastern United States.

**Illinois Records.**—DIXON SPRINGS: June 24, 1936, DeLong & Ross, 1 ♀. ULLIN: May 26, 1932, H. L. Dozier, 1 ♀.

#### 5. *Bandara aurata* (Ball)

*Eutettix aurata* Ball (1909a, p. 81).

Length 4.0–4.5 mm. Small, golden yellow or slightly darker, with a pair of narrow black lines along margin of vertex. Elytra golden, subhyaline, without white spots. Female seventh sternite, fig. 433D, narrow on lateral margins, posterior margin angularly produced to a blunt apex. Male plates, fig. 433I, long, slender on apical halves, apexes narrow, appressed. Styles short, broad at bases, sloping to broad apexes, which are pointed on inner margins. Aedeagus, fig. 433H, narrow, curved dorsally, then anteriorly beyond the base, apex divided into two long divergent processes.

This species is associated with pine in the Ohio River valley and the eastern portion of the United States. In Illinois we have not found this species on native pines but there is a possibility that it may become established in the extensive areas of pines that are being planted in the reforestation and national forest projects.

#### 91. *EUTETRIX* Van Duzee

*Eutettix* Van Duzee (1892d, p. 307).

Head short, slightly conical, transversely depressed, slightly sloping. Elytra moderately long, usually slightly flaring. Venation simple, one cross nervure between the sec-

tors; elytra without supernumerary veins, or ramose lines, and without pigment bands.

The species of this genus are mostly shrub feeders and occur on oak and probably other shrubby growth, chiefly in the western states. Hepner (1942) records 38 species for the United States, 7 of which occur in Illinois.

#### KEY TO SPECIES

1. Elytra usually dark in color, if light with a paler spot near apex of clavus; color pattern usually evident. . . . . 2  
Elytra light, white to fulvous, usually about the same throughout, without a light spot near apex of clavus. . . . . 6
2. Pronotum with a distinct dark band near posterior margin. . . . . 3  
Pronotum without a distinct dark band near posterior margin. . . . . 5
3. Elytra semihyaline, fulvous, sometimes slightly clouded along margin of clavus. . . . . 1. *tristis*  
Elytra not fulvous semihyaline, either opaque or spotted with opaque areas. . . . . 4
4. Male 5.5 mm. or more in length, female at least 7.0 mm. in length; vertex and scutellum usually orange; ventral fork of each pygofer hook, fig. 434B, greatly widened on outer half. . . . . 2. *pediculus*  
Male and female less than 5.5 mm. and 7.0 mm., respectively; vertex and scutellum white to yellow; ventral fork of each pygofer hook, fig. 434C, not greatly thickened on outer half. . . . . 3. *pictus*
5. Scutellum pale, with dark basal angles; pygofer hooks, fig. 434D, bifid. . . . . 4. *luridus*  
Scutellum darker, orange to fulvous, basal angles unicolorous; pygofer hooks, fig. 434E, not bifid. . . . . 5. *marmoratus*
6. Male more than 5.0 mm. in length, and female more than 5.5 mm. in length; ventral fork of each pygofer hook, fig. 434A, about as wide as dorsal forks. . . . . 6. *variabilis*  
Male and female less than 5.0 mm. and 5.5 mm. in length, respectively; ventral fork of each pygofer hook, fig. 434F, much narrower than dorsal forks. . . . . 7. *quercii*

#### 1. *Eutettix tristis* Ball

*Eutettix subaenea* var. *tristis* Ball (1907, p. 34).

Length of male 5.5 mm.; female 6.5 mm. Resembling *pictus* in general color, but paler and with dorsal fork of each pygofer hook extending as far as ventral fork. Vertex more than twice as wide as length at middle, almost parallel margined, transverse furrow shallow; vertex yellow, with two

large dark spots along anterior margin usually separated by a narrow yellow line, and with a wide dark band covering most of posterior half. Scutellum yellow; elytra semihyaline fulvous, with paler spots at apex of each clavus. Frons yellow, with two large black basal spots.

Female seventh sternite with posterior margin almost straight on either side of a

tex, pronotum, scutellum, and frons yellow, with dark markings, which include a spot on disc of frons; two large spots, each enclosing an ocellus, covering anterior half of vertex and basal portion of frons; spots separated at middle by a narrow light line; a broad band across posterior half of pronotum.

Female seventh sternite with the posterior

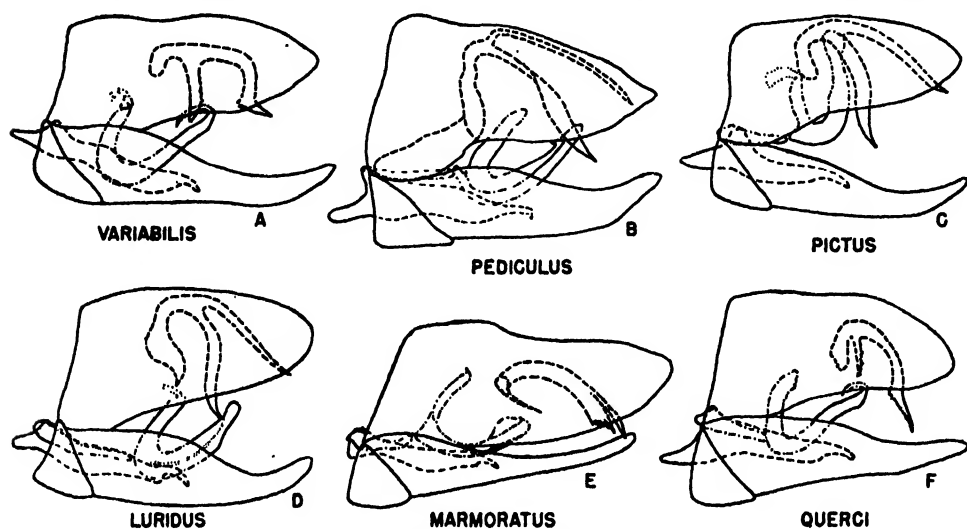


Fig. 434.—*Eutettix*. A–F, male genitalia.

produced median lobe. Each male pygofer hook bifid, bent near base, widest near middle, apex pointed; ventral fork widest near base, extending about as far as dorsal fork, pointed at apex; aedeagus almost parallel margined to outer third, narrowing to a bluntly pointed apex, which bears a pair of short processes on dorsal margin.

Recorded previously from the eastern states, this species has been taken in Illinois.

**Illinois Records.**—ALTON: June 26, 1934, DeLong & Ross, 1 ♂. ASHLEY: Aug. 7, 1917, 1 ♀. DUBOIS: Aug. 8–10, 1917, 4 ♀. GRAFTON: along river, June 26, 1934, DeLong & Ross, 1 ♀. MEREDOSIA: Aug. 19, 1917, 1 ♀.

## 2. *Eutettix pediculus* Hepner

*Eutettix pediculus* Hepner (1942, p. 273).

Length of male 5.75 mm.; female 7.0 mm. Resembling *pictus* in general appearance but larger and with distinctive male genitalia. Vertex about twice as wide between eyes at base as median length, almost parallel margined, transverse furrow shallow. Ver-

margin almost straight on either side of a prominent median lobe. Male pygofer hooks, fig. 434B, bifid, dorsal fork curved abruptly near base, almost parallel margined to pointed apex; ventral fork narrowest on basal third, much broader near middle, pointed at apex. Aedeagus almost parallel margined on basal three-fifths, gradually narrowing to a rounded apex, which bears a pair of short processes on dorsal margin.

This species is known to occur in some of the eastern states and in the Middle West.

**Illinois Records.**—ELIZABETHTOWN: July 8, 1935, Ross & DeLong, 1 specimen. ROSICLARE: July 5, 1935, Frison & Mohr, 1 specimen. ST. ANNE: Aug. 4, 1936, Frison & Burks, 1 ♂. THEBES: July 11, 1935, DeLong & Ross, 2 specimens.

## 3. *Eutettix pictus* Van Duzee

*Eutettix pictus* Van Duzee (1892c, p. 301).  
*Eutettix magnus* Osborn (1900c, p. 395).

Length 5–6 mm. Elytra dark brown to black, each with a yellow spot. Vertex,

pronotum, and scutellum yellow. Anterior half of vertex and posterior half of pronotum black. Elytra shiny black; usually a commissural spot on each clavus anterior to apex, and the anterior two-thirds of costal margin pale yellow; spots often lacking in dark male specimens. Face black, with a broad yellow band beneath eyes. Female seventh sternite with the posterior margin broadly and concavely excavated, with a median short blunt tooth. Each male pygofer hook, fig. 434C, bifid, with ventral fork broader than and slightly longer than dorsal fork, bent near base, gradually broadened to outer third, apex pointed. Aedeagus largest near middle, narrowing to a bluntly pointed apex, which bears a pair of short processes on dorsal margin.

This is one of the most brilliantly marked of all the species of the genus. It is recorded from the eastern states and has been taken from oak in different parts of Illinois.

**Illinois Records.**—Males and females, taken June 14 to November 19, are from Alton, Ashley, Dubois, Grand Tower, Havana, Herod, Karnak, Makanda, Meredosia, Oquawka, St. Anne, Shawneetown, and White Heath.

#### 4. *Eutettix luridus* (Van Duzee)

*Thamnottettix lurida* Van Duzee (1890b, p. 250).

Length 6 mm. Vertex, pronotum, and scutellum fulvous, elytra testaceous brown, subhyaline on costal area, the commissural spots on the apical half of each clavus and often the apex of scutellum creamy yellow. Face light brown, sutures darker. Female seventh sternite roundedly produced, slightly notched on either side of a short median produced tooth. Each male pygofer hook, fig. 434D, bifid, dorsal fork shorter than ventral, gradually narrowed to form a sharp apex; ventral fork slightly broader than dorsal, almost parallel margined to a sharp apex. Aedeagus largest at middle, narrowing on apical third to a rounded apex; in ventral view appearing bifid on outer third.

This species, taken from oak shrubs, apparently lives upon the host plant. It is recorded only from the eastern states.

**Illinois Records.**—Males and females, taken April 30 to November 22, are from Alto Pass, Carlinville, Dubois, Metropolis, Oakwood, Paris, Shawneetown, and White Heath.

#### 5. *Eutettix marmoratus* Van Duzee

*Eutettix marmoratus* Van Duzee (1892c, p. 302).

*Eutettix incerta* Gillette & Baker (1895, p. 100).

Length 5.5–6.0 mm. Vertex yellow; with a line in the transverse depression, two spots at apex, four spots along the base, and the median impressed line testaceous. Pronotum with traces of six testaceous longitudinal stripes. Elytra subhyaline, with testaceous brown blotches, paler on costa; usually a faint white or pale spot along commissural line on clavus; this obscured in dark-colored males. Female seventh sternite broadly excavated on either side of a short median apical tooth. Each male pygofer hook, fig. 434E, extending almost to apex of pygofer, broadest on outer third. Aedeagus almost parallel margined, with a pair of slender apical processes about one-third the length of the aedeagus shaft.

This species has been collected from oak and is found in rather small numbers upon that plant. It occurs in the eastern states and west to Colorado.

**Illinois Records.**—ALTON: June 26, 1934, DeLong & Ross, 1 specimen. APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 1 specimen. OREGON: Aug. 23, 1935, 1 specimen.

#### 6. *Eutettix variabilis* Hepner

*Eutettix variabilis* Hepner (1942, p. 269).

Length of male 5.5 mm.; female 6.5 mm. Resembling *querci* in general appearance, but larger and with distinctive male genitalia. Vertex about twice as wide as length at middle, almost parallel margined, transverse furrow usually distinct. Vertex, pronotum, and scutellum pale to darker yellow; males darker in color than females. Elytra semihyaline, veins of elytra usually concolorous.

Female seventh sternite with posterior margin excavated on each side of a median lobe, which is sometimes notched at middle. Each male pygofer, fig. 434A, long, two-thirds as wide at constriction as length from there to pointed apex; each pygofer hook bifid, dorsal fork curved ventrally just beyond middle and curved posteriorly near apex, ventral fork barely reaching to margin of pygofer, straight or slightly curved anteriorly. Aedeagus long, widest near base,

then almost parallel margined throughout its length to a pair of apical processes, which are about one-third the length of shaft.

This species was recorded previously only from Arkansas.

**Illinois Record.**—ALTON: June 26, 1934, DeLong & Ross, 1 ♂, 3 ♀.

### 7. *Eutettix querci* Gillette & Baker

*Eutettix querci* Gillette & Baker (1895, p. 101).

Length of male 4.75 mm.; female 5.5 mm. Rather uniformly colored, with distinctive male genitalia. Vertex about twice as wide as median length, with a distinct transverse furrow. Vertex, pronotum, and scutellum yellowish green in the male, fulvous in the female. Elytra semihyaline, fulvous in the male, with veins darkened posteriorly, more opaque in the female and tinged with green.

Female seventh sternite with the posterior margin excavated on each side of a rounded median lobe. Each male pygofer hook, fig. 434F, bifid, dorsal fork about twice as long as ventral, almost parallel margined to outer fourth, curved ventrally on outer fourth and posteriorly on outer fifth; prominent teeth along ventral margin; ventral fork slender and straight to a pointed apex. Aedeagus almost parallel margined throughout to a pair of apical processes, which are about one-third the length of the shaft, in ventral view parallel margined and bifid on outer sixth.

This species was recorded previously from Colorado, New Mexico, and Texas.

**Illinois Records.**—ALTON: June 26, 1934, DeLong & Ross, 1 ♂, 10 ♀. GOLCONDA: June 22, 1932, Ross, Dozier, & Park, 1 ♂.

### 92. *CHLOROTETTIX* Van Duzee

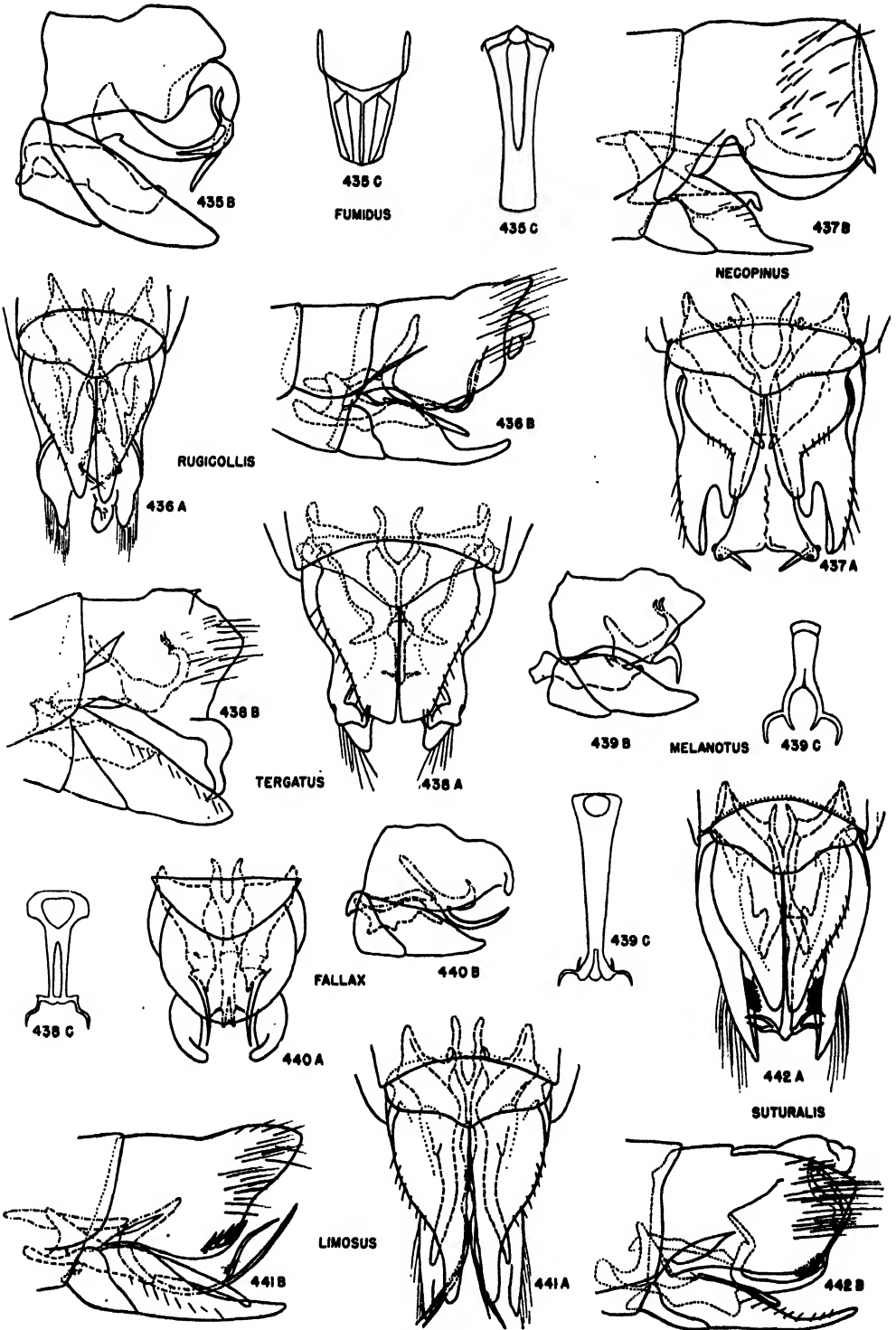
*Chlorotettix* Van Duzee (1892d, p. 306).

Fig. 204. Vertex varying from broadly rounded to bluntly angled and from a condition where the anterior margins are approximately parallel, to a well-produced vertex with the central portion much longer than next to eyes. Venation of elytra simple. Front broad. Leafhoppers of this genus are usually rather large in size, 6–8 mm., and are of some shade of pale green or yellowish green. Comparatively few bear color markings. They are closely related to certain of the species formerly included in the genus *Thamnotettix*.

More than 50 described species of *Chlorotettix* are now represented in the North American fauna, and half of these have already been taken in Illinois.

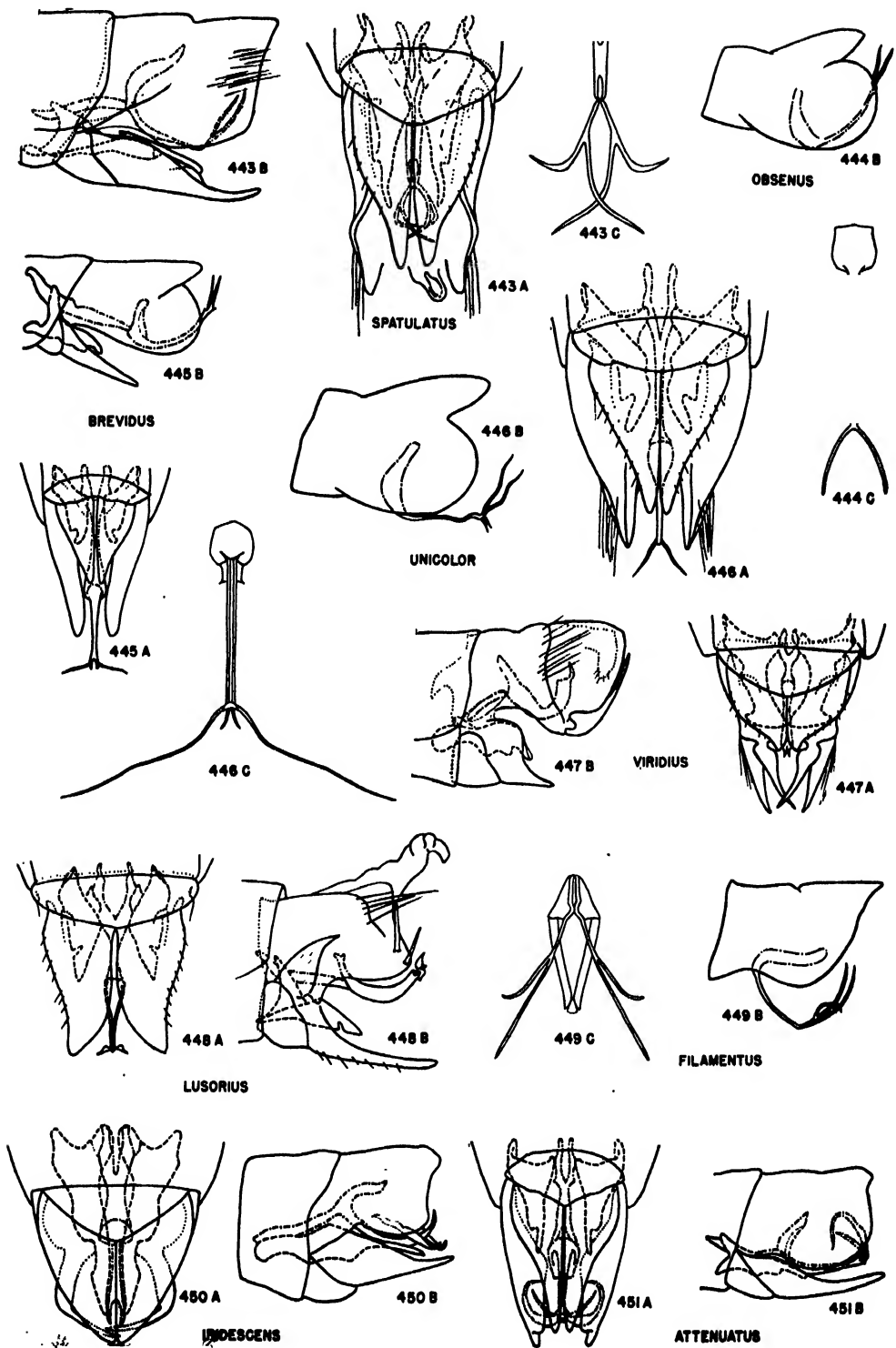
#### KEY TO SPECIES

1. Vertex with a broad red marginal band between the eyes.....1. *rugicollis*  
Vertex uniform green or yellowish green, without distinct red marginal band...2
2. Females.....26  
Males.....3
3. Vertex with anterior margin rounded, sometimes broadly rounded; length at middle equaling or slightly exceeding length next to eyes.....4  
Vertex with anterior margin distinctly but bluntly angled, length at middle decidedly greater than next to eyes....16
4. Dark in color, smoky, brownish or sordid green.....5  
Lighter in color, some shade of pale green or yellow.....9
5. Vertex with a broad transverse brown band between eyes; elytra dark brown, nervures pale, appearing striped.....  
.....2. *necopinus*  
Vertex without a transverse band between eyes.....6
6. A broad heavy ventrally directed spine arising on the middle of each caudal pygofer margin, fig. 435; apex of aedeagus gradually broadened, with a short straight process on each outer margin...  
.....3. *fumidus*  
Pygofer spine shorter and narrower, arising on ventrocaudal portion of each pygofer, as in fig. 440.....7
7. Each pygofer spine, fig. 440, narrow, about uniform in width, curved dorsally; aedeagus foot shaped, with the toe turned upward.....4. *fallax*  
Each pygofer spine broad at base, tapered to slender apex, curved ventrally, as in figs. 438, 439.....8
8. Aedeagus in lateral view, fig. 438, narrowed on apical third, apical processes curved but not branched.....  
.....5. *tergatus*  
Aedeagus in lateral view, fig. 439, not narrow before apical processes, which are branched.....6. *melanotus*
9. Vertex with a darker blotch on either side of apex. A smoky to bronze trilobate stripe extending along the claval wing margin. Male aedeagus, fig. 442, with short rather broad bifurcate processes at apex.....7. *suturalis*  
Vertex without dark blotches; elytra not marked by a sutural stripe.....10
10. Male plates longer than combined basal width, tapered to acute apices, as in fig. 441.....11  
Male plates shorter, combined width at base equaling twice their length, apices broadly, convexly rounded, as in fig. 447.....15
11. Terminal filamentous aedeagus processes bifurcate or branched, as in fig. 441....  
.....12



Figs. 435-442.—*Chlorotettix*, male genitalia. A, ventral aspect; B, lateral aspect; C, apical portion of aedeagus.

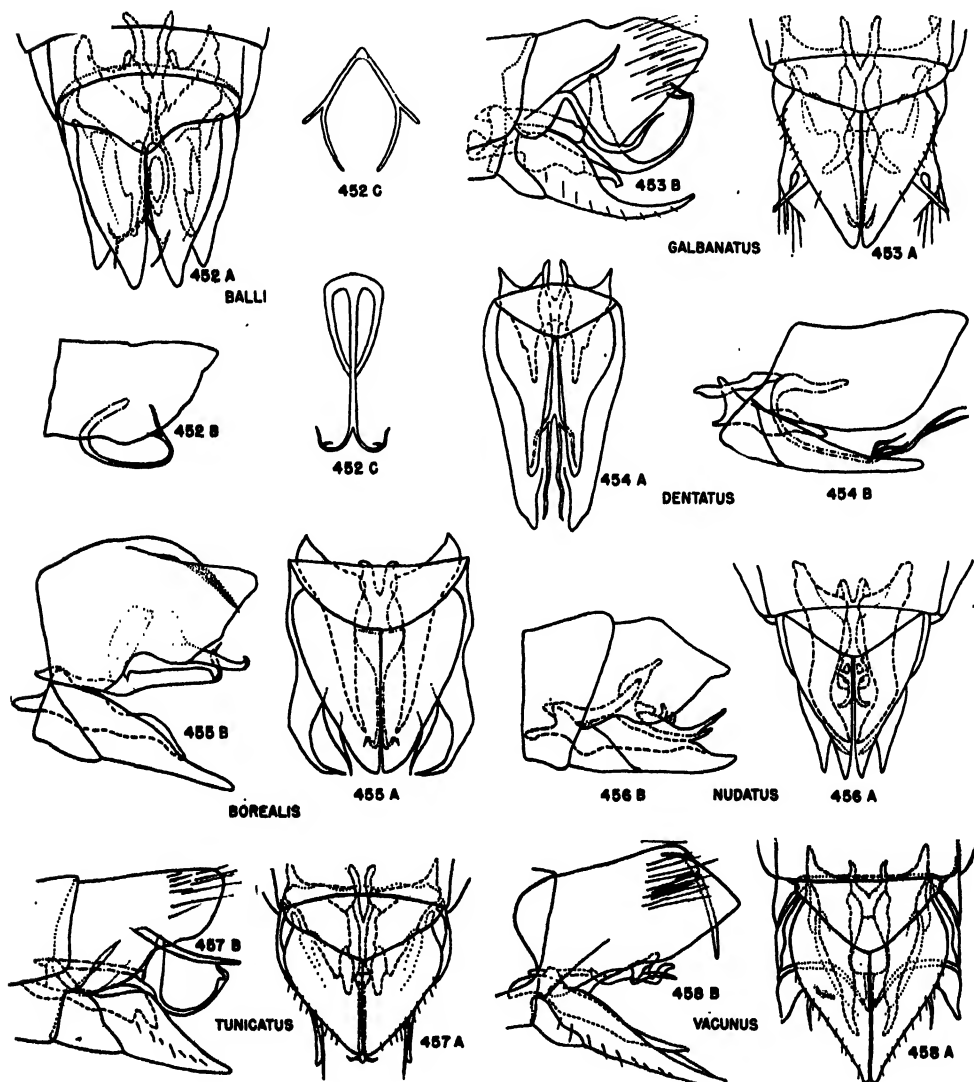
- Terminal filamentous aedeagus processes not branched or bifurcate. . . . . 13
12. Styles, fig. 441, extending beyond plates, conspicuous as black processes. Plates produced as narrow tips. Aedeagus with bifurcate slender terminal processes three times the length of the body of aedeagus. . . . . 8. *limosus*  
 Styles, fig. 443, shorter, not visible beyond plates. Apexes of plates more pointed and not so greatly produced. Aedeagus with bifurcate terminal processes that are less than twice the length of the body of aedeagus. . . . . 9. *spatulatus*
13. Aedeagus with a pair of very short processes between the longer processes at the end of the body of aedeagus, outer processes more than half as long as body of aedeagus, as in fig. 445. . . . . 14  
 Aedeagus, fig. 444, without short processes between terminal processes of aedeagus body; terminal processes not more than half as long as body of aedeagus. . . . . 10. *obsenus*
14. Terminal aedeagus processes, fig. 445, decidedly shorter than aedeagus body. . . . . 11. *brevius*  
 Terminal aedeagus processes, fig. 446, at least as long as body of aedeagus. . . . . 12. *unicolor*
15. Each male plate, fig. 447, broader at base than long. Each style short, broad, broadly truncate at apex. . . . . 13. *viridius*  
 Each male plate, fig. 440, more broadly and convexly rounded at apex, length equaling basal width. Each style long, broad, notched on outer margin near apex, which is abruptly narrowed and sharp pointed. . . . . 4. *fallax*
16. Vertex usually with a distinct brown median transverse band between eyes. . . . . 14. *lucorius*  
 Vertex without a transverse brown band. . . . . 17
17. Uniformly bronze iridescent in color. . . . . 15. *iridescens*  
 Not bronze iridescent, usually lighter, some shade of green or yellow. . . . . 18
18. Styles distinctly notched on outer margins near apexes, forming a straight or curved finger-like process on inner margin, as in fig. 451. . . . . 19  
 Styles not notched on outer margin near apexes, gradually tapering to blunt apexes, as in fig. 455. . . . . 23
19. Terminal processes of aedeagus branched or bifurcate. . . . . 20  
 Terminal processes of aedeagus not branched or bifurcate. . . . . 22
20. Each pygofer, fig. 451, rounded caudally, shallowly and concavely indented on dorsal half. . . . . 16. *attenuatus*  
 Each pygofer sloping obliquely from rounded ventrocaudal margin to produced dorsocaudal margin, as in fig. 452. . . . . 21
21. Apical processes, fig. 452, short, not exceeding one-third of ventral aedeagus body, with very short lateral branches on outer margins at middle. . . . . 17. *balli*
- Apical processes, fig. 449, long, about equaling length of ventral aedeagus body; lateral branches about one-third the length of apical processes and arising about one-third the distance from base. . . . . 18. *filamentus*
22. Finger process at apex of each style, fig. 453, curved outwardly, apex of aedeagus with two processes. . . . . 20. *galbanatus*  
 Finger process at apex of each style, fig. 454, longer, straight; apex of aedeagus with four processes. . . . . 19. *dentatus*
23. Each pygofer, fig. 455, with two spines, a conspicuous dorsal spine curved ventrally and a conspicuous ventral spine curved dorsally. . . . . 21. *borealis*  
 Each pygofer, fig. 456, with not more than one caudal spine. . . . . 24
24. Each pygofer, fig. 456, sloping on dorsal and ventral surfaces to a bluntly pointed apex, without a caudal spine. . . . . 22. *nudatus*  
 Each pygofer with caudal spine, as in fig. 457. . . . . 25
25. A long spine, fig. 458, on dorsal margin of each pygofer directed ventrally. . . . . 23. *vacunus*  
 A long straight spine, fig. 457, arising on ventrocaudal margin of each pygofer and directed caudad. . . . . 24. *tunicatus*
26. Vertex with anterior margin rounded, sometimes broadly rounded, length at middle equaling or slightly exceeding length next to eyes. . . . . 27  
 Vertex with anterior margin distinctly but bluntly angled, length at middle decidedly greater than next to eyes. . . . . 37
27. Dark in color, smoky, brownish, or sordid green. . . . . 28  
 Lighter in color, some shade of pale green or yellow. . . . . 31
28. Vertex with a broad transverse brown band between eyes; elytra dark brown, nervures pale, appearing striped. . . . . 2. *necopinus*  
 Vertex without a transverse band between eyes. . . . . 29
29. Length 7.5-8.0 mm. . . . . 3. *fumidus*  
 Length not over 7.0 mm. . . . . 30
30. Sordid green; northern in distribution. . . . . 5. *tergatus*  
 Usually darker, tinged with black; southern in distribution. . . . . 6. *melanotus*
31. Seventh sternite deeply notched on either side of a central spatulate process extending from apex of notch, as in fig. 459C. . . . . 32  
 Seventh sternite notched or excavated but without a spatulate process, as in fig. 460G. . . . . 35
32. Spatulate process of seventh sternite cleft at apex, fig. 460N. . . . . 8. *limosus*  
 Spatulate process not cleft at apex, fig. 459C. . . . . 9. *spatulatus*
33. Seventh sternite deeply, broadly notched, each side of notch bearing a lateral median tooth, fig. 460G. . . . . 13. *viridius*  
 Seventh sternite broadly, concavely rounded or notched but without teeth on lateral margin. . . . . 34



Figs. 443-451.—*Chlorotettix*, male genitalia. A, ventral aspect; B, lateral aspect; C, apical portion of aedeagus.



34. Vertex with a darker blotch on either side of apex; a smoky to bronze trilobate stripe extending along the claval margin of each elytron.....**7. suturalis**  
Vertex without dark blotches; elytra not marked by sutural stripes.....**35**
35. Seventh sternite broadly, concavely rounded with a narrow V-shaped notch at apex, the entire concave margin dark brown, fig. 459*E*.....**4. fallax**  
Seventh sternite broadly, angularly excavated, side of notch sloping to a narrow V-shaped notch at apex, as in fig. 460*M*.....**36**
36. Length 6.5-7.0 mm., darker green, veins dark green.....**10. obsenus**  
Length 7.5-8.0 mm., usually yellowish green in color.....**12. unicolor**, **11. brevidus**
37. Vertex usually with a distinct brown median transverse band between eyes.....**14. lusorius**  
Vertex without a transverse brown band.....**38**
38. Uniformly bronze iridescent in color.....**15. iridescens**  
Not bronze iridescent, usually lighter, some shade of green or yellow.....**39**
39. Seventh sternite deeply notched each side of a median spatulate process, which is produced from the apex.....**40**  
Seventh sternite without a spatulate process.....**41**
40. Spatulate process, fig. 459*A*, short and broad.....**16. attenuatus**  
Spatulate process, fig. 460*E*, longer, more slender.....**17. balli**



Figs. 452-458.—*Chlorotettix*, male genitalia. A, ventral aspect; B, lateral aspect; C, aedeagus.

41. Seventh sternite, fig. 459B, roundedly produced, with a small median notch and a larger one on either side forming a pair of short blunt approximate teeth ..... **19. dentatus**  
Seventh sternite notched or elevated, not produced, and without produced teeth ..... 42
42. Seventh sternite appearing somewhat truncate, with a deep notch at middle ..... 43  
Seventh sternite not appearing truncate, but notched or excavated from the rather narrow lateral angles ..... 44
43. Posterior margin of seventh sternite, fig. 459D, slightly indented between posterior angles, with a broad V-shaped notch at middle extending two-thirds the distance to base ..... **21. borealis**  
Posterior margin, fig. 460C, slightly, convexly rounded either side of a deep narrow U-shaped notch extending two-thirds the distance to base ..... **20. galbanatus**
44. Length not over 6.5 mm. .... 45  
Length 7.0 mm. or more. .... 46
45. Lateral margins of notch of seventh sternite, fig. 460I, evenly, convexly narrowed, apex pointed ..... **23. vacunus**  
Lateral margins of notch, fig. 460J, concavely rounded near posterior margin of sternite, then convexly rounded to a rounded apex ..... **25. distinctus**
46. Seventh sternite, fig. 460K, with posterior margin in the form of a brace sign, broadly concave, with a short median notch, the entire margin heavily embrowned ..... **22. nudatus**  
Seventh sternite, fig. 460L, with posterior margin broadly, concavely rounded with a brown V-shaped spot at apex ..... **24. tunicatus**

### 1. *Chlorotettix rugicollis* Ball

*Chlorotettix rugicollis* Ball (1903, p. 230).

Length 7 mm. Pale green, resembling *spatulatus* but with a broader vertex and a conspicuous red or pale orange transverse band on the margin of the vertex and front between the eyes; specimens from the Gulf of Mexico area are more darkly marked. The elytra of the males are often tinged with tawny brown. Vertex broadly rounded, only slightly longer at middle than next to eyes, about two and one-half times wider than long, evenly rounded to front.

Female seventh sternite deeply and triangularly excavated, with a strap-shaped tooth, similar to that in *spatulatus* extending posteriorly from the apex of excavation. Male plates, fig. 436, long, triangular. Style elongate, triangular, gradually sloping from base to narrowed produced finger-like apex.

Aedeagus with four long processes at apical end that are bent dorsally; basal third of aedeagus also curved dorsally, the sides nearly parallel.

This species is a common grass association species in Florida and along the Gulf Coast

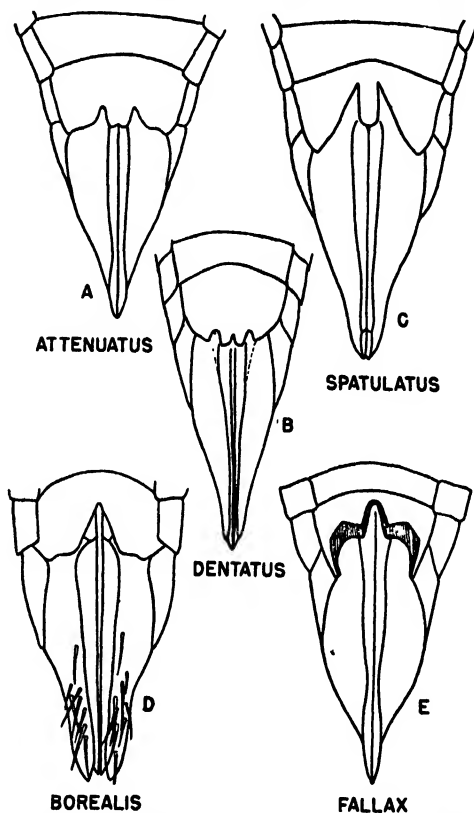
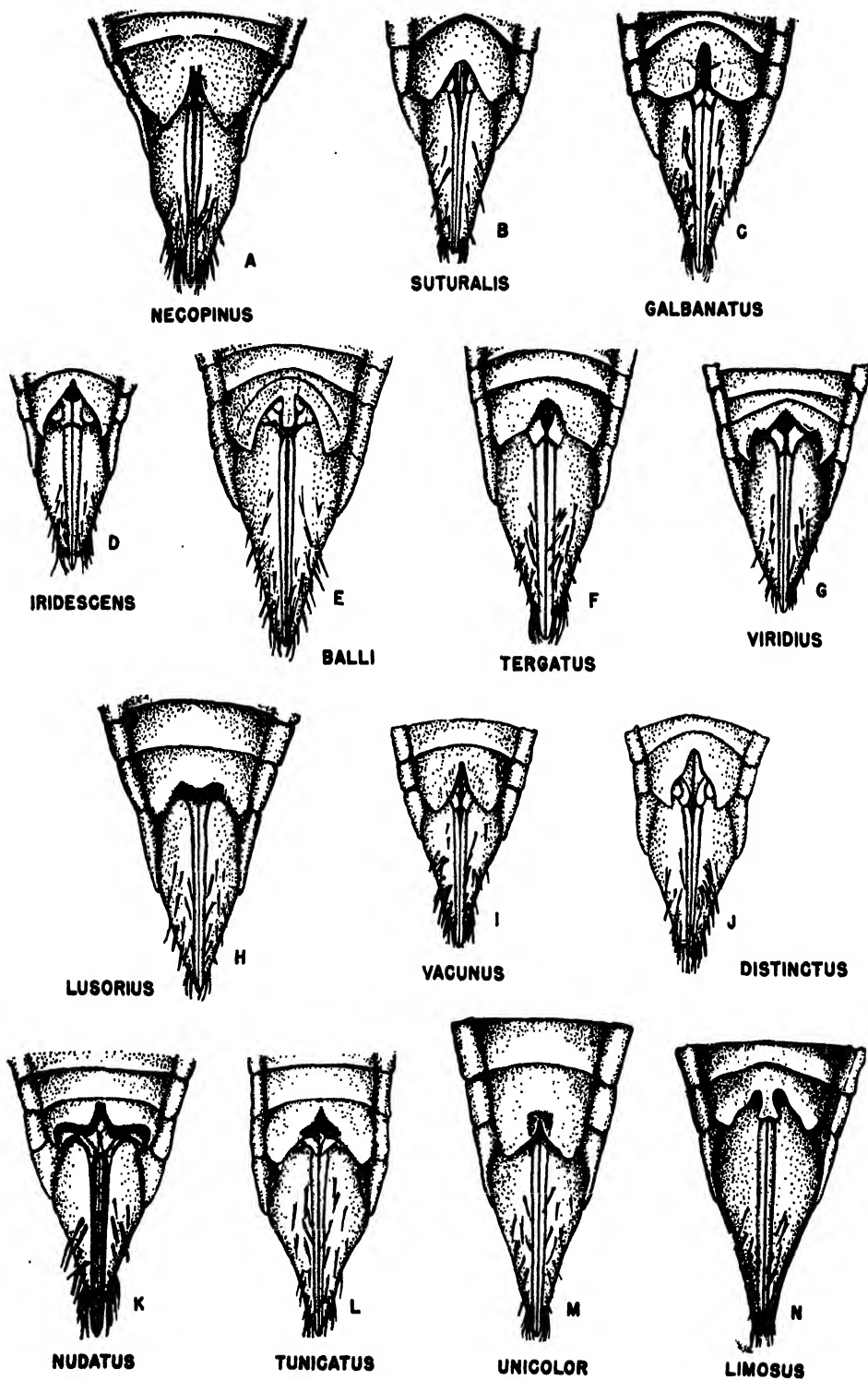


Fig. 459.—*Chlorotettix*. A-E, female genitalia.

and southern Atlantic Coast. Its occurrence in the old lake basin south and west of Chicago is unusual and interesting, but it is found in an association with several other Florida species of leafhoppers.

**Illinois Records.**—**ALSP:** Aug. 23, 1934, DeLong & Ross, 6 ♂, 7 ♀. **EVERGREEN PARK:** Aug. 23, 1934, DeLong & Ross, 42 ♂, 52 ♀. **GIBSONIA:** Oct. 2, 1934, DeLong & Ross, 1 ♀. **OAK LAWN:** in lamp globe, Aug. 22, 1934, DeLong & Ross, 36 ♂, 11 ♀. **OQUAWKA:** scrub oak, July 3, 1934, DeLong & Ross, 1 ♂, 1 ♀. **ST. ANNE:** July 20, 1934, DeLong & Ross, 1 ♂; Aug. 21, 1934, DeLong & Ross, 11 ♂, 7 ♀. **SUMMIT:** July 17, 1935, DeLong & Ross, 5 ♂, 5 ♀. **WAUKEGAN:** Aug. 24-26, 1917, 5 ♂. **ZION:** July 16, 1936, DeLong & Ross, 1 ♂.

Fig. 460.—*Chlorotettix*. A-N, female genitalia.

## 2. *Chlorotettix necopinus* Van Duzee

*Chlorotettix necopinus* Van Duzee (1893, p. 282).

Length 6.5–7.5 mm. Greenish testaceous, with a broad transverse blackish band on disc between eyes, elytra fuscous brown, with white nervures. Posterior margin of seventh sternite of female, fig. 460A, deeply and rather broadly incised nearly to its base. Male plates, fig. 437, broad at bases, suddenly constricted and then produced, tips divergent. Aedeagus in ventral view greatly broadened at apex; in lateral view narrowed toward apex, with a long spine on either side directed dorsally and extending to dorsal margin of pygofer, which is broadly rounded caudally. Styles rather short, broad at bases, tapered to pointed apices that are convergent.

A common species in grassy meadows in the southern United States, *necopinus* occurs in the southern part of Illinois in wooded grassy areas.

**Illinois Records.**—Males and females, taken June 14 to October 2, are from Cave in Rock, Dixon Springs, Eichorn, Elizabethtown, Fern Cliff, Golconda, Herod, Jonesboro, Mount Carmel, Shawneetown, and Vienna.

## 3. *Chlorotettix fumidus* Sanders & DeLong

*Chlorotettix fumidus* Sanders & DeLong (1919, p. 237).

*Chlorotettix fuscus* Brown (1933, p. 243).

Length 7.5–8.0 mm. Smoky green, resembling *tergatus* in form and coloration. Vertex produced, one-half longer at middle than next to eyes and about twice as wide as long. Elytra dark, smoky. Posterior margin of female seventh sternite truncate or slightly concave, with a broad deep median notch at middle extending two-thirds the distance to base. Male plates, fig. 435, short and broad, convexly rounded to appressed tips. Aedeagus with apex broadened and bearing a pair of dorsally directed processes on outer margins of broadened portion. A heavy elongate spine arising from caudoventral concavity of each pygofer and curved ventrally.

This species is found in coarse grasses, usually in marshy or swamp habitats. It is recorded only from Pennsylvania and Tennessee.

## 4. *Chlorotettix fallax* Sanders & DeLong

*Chlorotettix fallax* Sanders & DeLong (1922, p. 94).

*Chlorotettix latifrons* Sanders & DeLong (1922, p. 95).

Length 7.5–8.0 mm. Large, dull greenish yellow, with broadly rounded vertex, twice as wide as long, and elytra smoky at apices. Female seventh sternite, fig. 459E, with posterior margin strongly, concavely excavated half way to base, with a V-shaped notch at middle extending entirely to base; posterior margin and notch broadly bordered with dark brown. Male plates, fig. 440, strongly, convexly rounded, semi-circular in outline, width of plates at bases together twice their length. Each pygofer sloping ventrally and dorsally to bluntly pointed apex, a long, curved spine arising from ventrocaudal margin. Aedeagus foot shaped, with the toes turned upwards. Each style rather broad, notched near base on inner margin and near apex on outer margin, abruptly sloping from both margins to form pointed apex.

This species occurs on the coarse sedges of both the fresh-water and salt marsh. It was first described from specimens taken at the margin of the salt marsh in Virginia and from the Gulf Coast of Mississippi, also from specimens taken in the heart of the Florida everglades. In Illinois it occurs in the marsh habitat of the Chicago area.

**Illinois Records.**—OAK LAWN: in lamp globe, Aug. 22, 1934, DeLong & Ross, 1 ♀; Sept. 6, 1935, T. H. Frison, 2 ♂, 4 ♀. OQUAWKA: July 30, 1936, Mohr & Burks, 1 ♀. SUMMIT: Aug. 21, 1935, DeLong & Ross, 1 ♀. WAUKEGAN: Aug. 5, 1935, Ross & DeLong, 1 ♀.

## 5. *Chlorotettix tergatus* (Fitch)

*Bythoscopus tergatus* Fitch (1851, p. 58).

Length 7 mm. Large, sordid green, round headed, without definite color markings. Pronotum and scutellum often washed with yellowish green. Elytra usually smoky. Vertex slightly longer at middle than next to eyes, a little more than twice as wide as long.

Female seventh sternite, fig. 460F, twice as long as preceding, posterior margin with a broad V-shaped notch extending half way to the base, lateral lobes rounded. Male

plates, fig. 438, large, broad, covering pygofer, apices broad, obtuse. Aedeagus in lateral view broad at middle, with a slender anteriorly and dorsally directed anterior third; posterior third narrowed, curving dorsally; apex with a transverse portion bearing a pair of divergent, spinelike processes on its outer margins, each process sinuate.

This is a common northern swamp and bog species, and so far is not known to occur in any of the southern states. It is found in the tall coarse grass and sedge association in swampy areas or at the margins of tamarack-sphagnum bogs.

**Illinois Records.**—Many males and females, taken June 27 to October 6, are from Algonquin, Alton, Antioch, Beach, Cedar, Dixon Springs, Dolson, Golconda, Grafton, Grand Detour, Herod, Jonesboro, Kansas, Karnak, McHenry, Monticello, Normal, Oak Lawn, Olive Branch, Palos Park, Princeton, Quincy, Urbana, Vienna, Volo, and Waukegan.

#### 6. *Chlorotettix melanotus* DeLong

*Chlorotettix tergatus* var. *melanotus* DeLong (1916, p. 84).

Length 7.5 mm. Dark green, resembling *tergatus* so closely in coloration and structural characters that the two can scarcely be distinguished by external characters. Usually *melanotus* is darker in color. Male genitalia, fig. 439, and female seventh sternite very similar to those of *tergatus*. Aedeagus with an enlarged basal portion from which arises a short anterior process directed dorsally; a posterior process of about the same length extends dorsally and is bifurcate at apex, with a curved slender portion arising on the outside of each bifurcate piece near its apex. Each pygofer spine arises ventrally as in *tergatus* but is much smaller; curved, and not sinuate as in that species.

The habitat and distribution pattern of this species are entirely different from those of *tergatus*. This species occurs abundantly in wet pastures and meadows and is sometimes a hillside species in the southern states or southern portions of states just north of the Ohio River.

**Illinois Records.**—DOLSON: July 24, 1936, DeLong & Mohr, 2♀. KARNAK: July 10, 1935, DeLong & Ross, 2♀.

#### 7. *Chlorotettix suturalis* DeLong

*Chlorotettix suturalis* DeLong (1916, p. 85).

Length 7.5 mm. Pale green or yellowish, with a median brown line, sometimes only faintly visible, extending along commissural line of each elytron. Vertex bluntly angled. Posterior margin of female seventh sternite, fig. 460B, broadly, deeply notched more than half way to base, the sides dark brown. Male plates, fig. 442, broad and long, convexly narrowed to rounded tips. Aedeagus in lateral view with a long dorsally directed bifid process, each portion of which is bifurcate. Each pygofer with caudal margin almost truncate, obliquely sloping to slightly produced dorsal margin. Styles notched on outer margins near apices, forming curved finger-like apices arising on inner margins and curved outwardly.

This is one of the more common species, occurring in thickets of the cane, *Arundinaria tecta*, which is commonly found in the moist stream floodplains of the southern fourth of the state. Field studies have indicated that it is restricted to this plant host and does not normally occur upon other vegetation. This species was previously reported only from Tennessee.

**Illinois Records.**—HEROD: Aug. 4, 1934, DeLong & Mohr, 2♂, 4♀; July 8-11, 1935, DeLong & Ross, 2♂; June 24, 1936, DeLong & Ross, 1♂, 3♀. JONESBORO: July 31, 1934, DeLong & Mohr, 1♀. JUSTICE: July 23, 1937, Mohr & Burks, 2♀. NORRIS CITY: June 17, 1934, DeLong & Ross, 1♀. OQUAWKA: July 3, 1934, DeLong & Ross, 1♀. PRINCETON: June 28, 1937, Ross & Burks, 2♂. THEBES: July 11, 1935, DeLong & Ross, 5♂, 4♀. VIENNA: June 14, 1934, DeLong & Ross, 1♂, 3♀; July 29, 1934, DeLong & Ross, 1♂, 2♀; on cane, July 10, 1935, DeLong & Ross, 2♂, 3♀.

#### 8. *Chlorotettix limosus* DeLong & Cartwright

*Chlorotettix limosus* DeLong & Cartwright (1926, p. 506).

Length 7-8 mm. Broad headed, yellowish green. Posterior margin of seventh sternite of female excavated half way to base on either side of a prominent spatulate process, the latter cleft at apex, cleft extending half the distance of the excavation. Male plates, fig. 441, rather long, convexly rounded two-

thirds their length, then concavely rounded to blunt rounded apices. Aedeagus with two bifurcate terminal processes forming four long straight slender processes. Each pygofer with a long dorsal produced lobe, caudal margin slightly concave. Each style long, apical half slender, produced beyond lateral margin of plate near its apex.

Recorded previously only from Pennsylvania, this species occurs in the fresh-water marsh on coarse grasses in a mixed association of grasses and sedges. It can easily be distinguished by the long slender styles and by the four long terminal processes of the aedeagus.

**Illinois Records.**—DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♀; June 24, 1936, DeLong & Ross, 1 ♂. KARNAK: Aug. 8, 1934, DeLong & Mohr, 8 ♂, 10 ♀; July 10, 1935, DeLong & Ross, 3 ♂, 4 ♀. SHAWNEETOWN: June 14, 1934, DeLong & Ross, 1 ♀; June 23-27, 1936, DeLong, Ross, & Mohr, 2 ♂, 11 ♀. TEMPLE HILL: June 24, 1936, DeLong & Ross, 1 ♂, 1 ♀. WATSON: Oct. 1, 1934, Frison & Ross, 1 ♀. WOLF LAKE: July 30, 1934, DeLong & Mohr, 2 ♀.

#### 9. *Chlorotettix spatulatus* Osborn & Ball

*Chlorotettix spatulatus* Osborn & Ball (1897, p. 225).

Length 7 mm. Greenish yellow, broad headed, female seventh sternite with spatulate process. Posterior margin of female seventh sternite, fig. 459C, broadly notched more than half way to base, apex of notch bearing a spatulate process that extends two-thirds the length of the notch. Male plates, fig. 443, broad at bases, acutely pointed. Aedeagus with a pair of bifurcate processes arising at apex, each of these with a long inner branch curved inwardly and an outer shorter branch arising some distance from apex of aedeagus body; short branch curves laterally and is broadened at middle. Each pygofer sloping on caudal margin from curved ventral to produced angled dorsal margin.

A common species of the northern Illinois fresh-water marsh and wet meadow, this species is also frequently found in moist areas of the prairie. It occurs in Florida and is widely distributed in the Middle West.

**Illinois Records.**—Many males and females, taken June 13 to September 30, are

from Albion, Algonquin, Beach, Cache, Clayton, Des Plaines, Evergreen Park, Fulton, Meredosia, Oak Lawn, Princeton, Rising Sun, St. Anne, Summit, Thomson, Urbana, Waukegan, and Zion.

#### 10. *Chlorotettix obsenus* DeLong

*Chlorotettix obsenus* DeLong (1937c, p. 52).

Length 7-8 mm. Pale green, with broadly rounded head. Vertex not quite three times as wide between eyes as median length, produced at middle about two-thirds its length before anterior margins of the eyes. Female seventh sternite with lateral margins produced about two-thirds their length, then gradually and obliquely sloping to form produced lobes, between which the margin is excavated about one-third the distance to base; posterior margin gently sloping to the central fourth, which is more abruptly and almost concavely notched; base of the broad V-shaped notch brownish. Male plates, fig. 444, triangular, about as long as combined basal width, greatly exceeded by pygofers. Aedeagus, in ventral view, constricted at about two-thirds its length, then bifurcate, forming two slender terminal processes, which are not more than half as long as the basal portion.

Described from Illinois, this is a marsh species occurring on coarse grasses in grass-sedge habitats.

**Illinois Records.**—ST. ANNE: July 20, 1934, DeLong & Ross, 1 ♂. ZION: July 6, 1932, Frison *et al.*, 1 ♀; July 25, 1934, Frison & DeLong, 3 ♂, 3 ♀.

#### 11. *Chlorotettix brevidus* DeLong

*Chlorotettix brevidus* DeLong (1937c, p. 52).

Length 6.5-7.0 mm. Bright green, tinged with yellow, and with a broadly rounded vertex, which is three times as wide between eyes as length at middle. Female seventh sternite with posterior margin shallowly concave between a pair of broad slightly produced lobes; between the inner pair the segment is deeply notched more than one-third the distance to the base; sides of the V-shaped notch are straight and the apex brownish. Male plates, fig. 445, triangular, sharply angled at apices. Ventral margins of ninth sternite not overlapping but forming a keel, which is conspicuous caudad of the plates. Also the caudal notch in the

pygofer near the posterior margin is shorter and more sharply notched at base than in *unicolor*. Aedeagus is the same form and type as in *unicolor*, but the terminal processes are proportionately shorter, in every case being conspicuously shorter than the basal portion of the aedeagus.

This species occurs on grasses of the sand prairie. It is known only from Illinois.

**Illinois Records.**—OAK LAWN: sand prairie, July 27, 1934, 1 ♀. THOMSON: sand prairie, July 8, 1934, DeLong & Ross, 3 ♂, 6 ♀. ZION: July 25, 1934, Frison & Lee, 1 ♂.

### 12. *Chlorotettix unicolor* (Fitch)

*Bythoscopus unicolor* Fitch (1851, p. 58).

*Chlorotettix vanduzeei* Baker (1892*d*, p. 219).

Length 7.5 mm. Green or yellowish, broad headed. Posterior margin of female seventh sternite, fig. 460*M*, broadly, shallowly notched, narrowed and sharp at apex. Male plates, fig. 446, broad at base, outer margins of each concave on apical half, apexes produced and divergent. Pygofers deeply notched on caudal margins. A pair of very short processes at end of body of aedeagus; also a pair of long processes arising and extending laterally, these processes as long as ventral portion of aedeagus body. Each style short, broad at base, notched on outer margin near apex.

This is a large and common species in the northern United States, occurring in the fresh-water marsh and in coarse meadow grasses.

**Illinois Records.**—Many males and females, taken June 2 to August 24, are from Apple River Canyon State Park, Beach, Carman, Des Plaines, Evergreen Park, Fox Lake, Fulton, Grand Detour, Harvard, Palos Park, Princeton, St. Anne, Summit, Volo, Wauconda, Waukegan, and Zion.

### 13. *Chlorotettix viridius* Van Duzee

*Chlorotettix viridius* Van Duzee (1892*d*, p. 309).

Length 6-7 mm. Round headed, apple green. Posterior margin of female seventh sternite, fig. 460*G*, broadly excavated almost to base, the sides of incisure interrupted at middle by a short obtuse blackish tooth. Male plates, fig. 447, nearly rectangular, transverse, a little longer than valve, apexes of plates slightly produced and divergent.

Aedeagus in lateral view constricted near apex, forming a dorsally directed finger-like apex that appears bifid in caudal view. Each style short, broad at base, slightly narrowed between base and apex, which is again broadened and almost truncate. Pygofers with long spines arising ventrally and extending dorsally and caudally.

This is a common species of meadows, pastures, and grassy areas in the eastern and southern states and occurs abundantly in portions of Illinois.

**Illinois Records.**—Many males and females, taken March 11 to October 2, are from Adair, Albion, America, Beardstown, Bloomington, Carbondale, Carman, Cave in Rock, Centralia, Dongola, Dubois, DuQuoin, Edgewood, Eichorn, Elizabethtown, Evergreen Park, Fairfield, Fern Cliff, Fulton, Geff, Golconda, Grafton, Harrisburg, Havana, Herod, Homer, Kampsville, Karnak, Lawrenceville, Macomb, Marshall, Metropolis, Mount Carmel, Oquawka, St. Anne, Shawneetown, Thebes, Urbana, Vienna, Watson, and York.

### 14. *Chlorotettix lusorius* (Osborn & Ball)

*Thamnotettix lusoria* Osborn & Ball (1897, p. 226).

Length 7-8 mm. Olive brown, with a faint crescentiform band before the eyes; vertex produced, twice as wide as long. Elytra with a dull reddish tinge. Posterior margin of female seventh sternite, fig. 460*H*, emarginate, with a broad angularly pointed dark margined median tooth half as long as the acutely rounded lateral angles. Male plates, fig. 448, one-half longer than broad at bases, outer margins thickened, apexes bluntly pointed and strongly divergent. Aedeagus with a short lateral process extending laterally on either side at apex. Styles short, each broad at base and triangular, with a short V-shaped notch on outer margin of each near apex. Each pygofer a little longer on ventral than on dorsal margin, two spines arising on ventral half.

This species is usually found in the herbaceous growth of open woodland areas in the northern United States and Canada. It has been taken frequently in Illinois in habitats of this type.

**Illinois Records.**—Males and females, taken June 11 to October 2, are from Apple River Canyon State Park, Dolson, Herod,

Hopedale, Marshall, Monticello, Muncie, Oakwood, Temple Hill, Urbana, and White Heath.

### 15. *Chlorotettix iridescens* DeLong

*Chlorotettix iridescens* DeLong (1916, pp. 83, 86).

Length 7 mm. Bronze or brownish, tinged with green, appearing iridescent. Vertex one-third longer at middle than next to eyes, more than twice as wide as long. Female seventh sternite, fig. 460D, broadly, deeply excavated to base, sides of excavation concave, convex near apex, forming long rather sharply rounded lateral angles. Male plates, fig. 450, broad and rather short, convexly rounded, with bluntly angled apices. Styles long, apices bluntly angled, each broadly and concavely notched on outer margin about one-third the distance from apex. Aedeagus in lateral view with a dorsal anterior process, body curving ventrally and caudally, apex bifid. Each pygofer concave on caudal margin; spines arising on ventrocaudal margin and hooked at the apices.

This species occurs in abundance in the floodplain woods on grasses in a mixed habitat of grasses, cane, violets, and similar plants of the wet soils of this habitat. It was previously recorded from Maryland and Tennessee.

**Illinois Records.**—BEARDSTOWN: Sept. 1, 1939, Ross & Riegel, 2♂, 1♀. DIXON SPRINGS: July 29, 1934, DeLong & Ross, 1♂, 3♀. HEROD: Aug. 4, 1934, DeLong & Ross, 30♂, 36♀.

### 16. *Chlorotettix attenuatus* Brown

*Chlorotettix attenuatus* Brown (1933, p. 241).

Length 6.75–7.0 mm. Yellowish green, with dark eyes. Vertex bluntly angled, one-half longer at middle than next to eyes. Female seventh sternite, fig. 459A, with posterior margin excavated to about one-half the length of the segment and bearing a short spatulate process, which is about as wide as long. Male plates, fig. 451, broad at bases, slightly narrowed to long acute apices, which about equal the pygofers. Each style long and abruptly narrowed at about middle, apical third spinelike and curved outwardly. Aedeagus long in lateral view, with an anterior dorsally curved broadened portion; apex with a pair of short

dorsally curved processes, and a pair of long processes extending dorsally and broadly curved with pointed apices directed ventrally; in ventral view with a pair of lateral outwardly directed spines, from near the base of which a long tapering process arises each side of middle and extends anteriorly, with a recurved apex.

Described from Missouri, this species is now recorded from Illinois.

**Illinois Records.**—DIXON SPRINGS: June 24, 1936, DeLong & Ross, 1♂. KARNAK: July 10, 1935, DeLong & Ross, 2♀. SHAWNEETOWN: June 23, 1936, DeLong & Ross, 8♂, 25♀.

### 17. *Chlorotettix balli* Osborn

*Chlorotettix balli* Osborn (1898, p. 246).

Length 7.0–7.25 mm. Yellowish green. Vertex angularly produced, one-half longer at middle than next to eyes. Female seventh sternite, fig. 460E, with a deep notch extending almost to the base and including a spatulate process; sides of process straight, lateral margins angled. Male plates, fig. 452, gradually narrowed to acute apices. Aedeagus with a pair of bifurcate processes at apex. Each style broad at base, concavely narrowed to straight finger-like process. Pygofers slightly concave on posterior margins, angled with dorsal margins.

Recorded previously from Tennessee, Ohio, and Iowa, this is a rather common species in open woodland or flat marshy meadow on thick luxuriant growths of mixed grasses.

**Illinois Records.**—Many males and females, taken June 5 to August 22, are from Alton, Apple River Canyon State Park, Cave in Rock, Dixon Springs, Dolson, Elizabethtown, Farina, Galena, Golconda, Hardin, Herod, Justice, Kankakee, Metropolis, Monticello, Norris City, Oakwood, Pike, Rock Island, Shawneetown, Temple Hill, Urbana, Vienna, and White Pines Forest State Park.

### 18. *Chlorotettix filamentus* DeLong

*Chlorotettix filamentus* DeLong (1937c, p. 53).

Length 7 mm. Green, tinged with yellow, and with produced bluntly angled vertex, which is twice as wide between eyes as median length. Each male plate, fig. 449, triangular, outer margin convexly rounded at base, then concavely rounded before



apex, which is narrow but bluntly rounded; combined width at base a little greater than length. Aedeagus similar in type to that of *balli* but differing by having the inner branch of each bifurcate process at the apex at least twice as long as the corresponding branch in *balli*, and the outer branch is at least four times as long as the corresponding process in *balli*. Female unknown.

Described from Illinois, this species is known by only three male specimens.

**Illinois Records.**—HAVANA: Aug. 30, 1917, 1 ♂. MARSHALL: Sept. 27, 1934, Frison & Ross, 2 ♂.

### 19. *Chlorotettix dentatus* Sanders & DeLong

*Chlorotettix dentatus* Sanders & DeLong (1923, p. 154).

Length 8 mm. Yellow to green, with a roundedly produced vertex, which is twice as wide as long and almost one-half longer at middle than next to eyes. Posterior margin of female seventh sternite, fig. 459B, notched on either side of a pair of rounded slightly produced median teeth on the median fourth; sternite convex ventrally, almost keeled. Male plates, fig. 454, convexly rounded to half their length, then rather abruptly constricted and produced as narrow parallel tips with blunt apices.

Previously recorded from the District of Columbia and Maryland, this species has been taken in Illinois and is found in marshy meadow habitats.

**Illinois Records.**—KARNAK: Aug. 8, 1934, DeLong & Mohr, 4 ♀; July 10, 1935, DeLong & Ross, 1 ♂.

### 20. *Chlorotettix galbanatus* Van Duzee

*Chlorotettix galbanatus* Van Duzee (1892d, p. 310).

Length 6.0–6.5 mm. Yellowish green in color, with an obtusely angled vertex, which is one and one-half times as long at middle as next to eyes. Female seventh sternite, fig. 460C, with a rather broad notch reaching two-thirds the distance to base; lobes on posterior margin laterad of the notch broadly rounded or slightly angled at middle. Male plates, fig. 453, evenly, convexly rounded from bases to apices, inner margins at apices depressed, apices obtusely angled. Aedeagus in lateral view broad at base,

narrowed about middle and produced as a long narrow portion with a pair of processes at apex. Each style broad, rather short, abruptly narrowed on outer margin near apex, forming a curved finger-like process.

This is probably the most common species of the genus, occurring throughout Illinois in pastures and meadows on many types of grasses. It is found in the eastern states and west to Montana.

**Illinois Records.**—Many males and females, taken June 3 to October 11, are from Algonquin, Alton, Alto Pass, Amboy, Anna, Apple River Canyon State Park, Ashley, Brownfield, Cairo, Carbondale, Carmi, Castle Rock, Champaign, Cobden, Danville, Dixon Springs, Dolson, Dongola, Dubois, Duncans Mills, Eichorn, Elizabethtown, Fairfield, Fern Cliff, Fulton, Galena, Gibsonia, Golconda, Grafton, Grand Detour, Grand Tower, Hardin, Havana, Herod, High Knob, Justice, Jonesboro, Kampsville, Kankakee, Karnak, Lima, Marshall, Meredosia, Metropolis, Monticello, Mount Carmel, Muncie, New Holland, Norris City, Oak Lawn, Oakwood, Olive Barnch, Oquawka, Pike, Princeton, Quincy, Ripley, Rock Island, St. Anne, St. Joseph, Savanna, Shawneetown, Spring Valley, Starved Rock State Park, Sumner, Sun Lake, Temple Hill, Urbana, Ursa, Vandalia, Vienna, Villa Ridge, Warren, Watson, White Heath, White Pines Forest State Park, and Wolf Lake.

### 21. *Chlorotettix borealis* Sanders & DeLong

*Chlorotettix borealis* Sanders & DeLong (1917, p. 92).

Length 6.0–6.5 mm. Greenish yellow, with dark eyes. Vertex obtusely angled, one-half longer at middle than next to eyes. Female seventh sternite, fig. 459D, with posterior margin truncate and with a narrow median V-shaped notch extending half way to base. Male plates, fig. 455, broad at bases, convexly rounded to obtusely angled apices. Aedeagus in lateral view with small upturned process at apex. Styles long, gradually narrowed to attenuated apices. Pygofer each with a long spine on dorsal side separated by a deep notch, and a long spine on ventral margin extending dorsally.

In Illinois this species has been taken on fine grasses in sandy areas in open wood-

land. It was previously recorded from Wisconsin.

**Illinois Records.**—Males and females, taken July 8 to October 2, are from Cave in Rock, Dixon Springs, Dolson, Elizabethtown, Grand Detour, Oregon, St. Anne, Springfield, and Vienna.

## 22. *Chlorotettix nudatus* Ball

*Chlorotettix nudata* Ball (1900c, p. 340).

Length 7.5 mm. Green, with a brownish or smoky tint. Vertex twice as long at middle as next to eyes, slightly, conically pointed. Female seventh sternite, fig. 460K, with posterior margin distinctly darker marked and divided into four lobes by a narrow slit in the middle and a pair of broad shallow notches a little more than half way toward the sides. Male plates, fig. 456, broad at bases, convexly and then concavely narrowed to acutely pointed apices. Pygofer sloping ventrally and dorsally to bluntly pointed apices. Styles long, tapered, bent inwardly one-third the distance from apices. Aedeagus bifid at apex.

Recorded previously from Tennessee and Iowa, this species occurs in abundance on grasses in the floodplain woods. It seems to be confined almost entirely to moist woodland areas that support a rich growth of grasses.

**Illinois Records.**—Males and females, taken June 24 to October 3, are from Danville, Dixon Springs, Dolson, Elmira, Herod, High Knob, Kankakee, Oakwood, Pike, Temple Hill, Urbana, Vienna, and White Heath.

## 23. *Chlorotettix vacunus* Crumb

*Chlorotettix vacuna* Crumb (1915, p. 196).

Length 6.0–6.5 mm. Yellowish, tinged with green; vertex bluntly angled, one-half broader than long and one-third longer at middle than next to eyes.

Female seventh sternite, fig. 460I, with posterior margin broadly, somewhat convexly excavated three-fourths the distance to base, lateral lobes bluntly angled. Male plates, fig. 458, broad at bases, outer margins convexly narrowed to near apices, where they are slightly concave to form acute tips. Aedeagus in lateral view narrow at base, broadened at apex, and deeply notched. Styles long and narrow, gradually narrowed from bases to apices. Each pygo-

fer pointed at apex with a long dorsal spine.

This is a grass species occurring in southern areas of Illinois. It was recorded previously from Tennessee, and does not occur in abundance.

**Illinois Records.**—Males and females, taken June 12 to August 14, are from Dixon Springs, Eichorn, Elizabethtown, Fairfield, Herod, Jonesboro, Karnak, La Rue, and Vienna.

## 24. *Chlorotettix tunicatus* Ball

*Chlorotettix tunicata* Ball (1900c, p. 340).

Length 7 mm. Pale yellowish green, with greenish elytra. Vertex produced, one-half longer at middle than next to eyes, twice as wide as long.

Female seventh sternite, fig. 460L, with posterior margin roundedly emarginate one-third the depth of the segment, sometimes slightly notched at middle but always appearing notched because of a brown V-shaped spot at middle of emargination. Male plates, fig. 457, broad at base, roundedly narrowed to a very obtuse, almost truncate apex, plates together the shape of a bluntly pointed spoon. Each pygofer concave on caudoventral margin, with a long straight spine arising in middle of concavity and directed caudally. Aedeagus in lateral view broad at base, apical two-thirds narrow, notched at apex, forming an anteriorly directed short finger-like process. Styles broad at bases, triangular, apices bluntly pointed.

This species occurs on grasses in open woodland areas in the eastern and southern states.

**Illinois Records.**—Many males and females, taken June 14 to October 8, are from Alton, Amboy, Anvil Rock, Apple River Canyon State Park, Cave in Rock, Dixon, Dolson, Fulton, Havana, Kankakee, Metropolis, Pike, St. Anne, Shawneetown, Temple Hill, Urbana, Vienna, and White Heath.

## 25. *Chlorotettix distinctus* DeLong

*Chlorotettix distinctus* DeLong (1919, p. 23).

Length 6 mm. Yellow, tinged with green. Vertex bluntly angulate, almost one-half longer at middle than next to eyes. Female seventh sternite, fig. 460J, with posterior margin deeply and broadly notched two-thirds the distance to base; sides of apical

half straight, basal half with sides concavely rounded to form a bluntly angled lobe on either side.

Described from Tennessee, this species is known only from the female. In Illinois, it occurs only in the southern part of the state.

**Illinois Records.**—VIENNA: July 29, 1934, DeLong & Ross, 1 ♀. VOLO: July 27, 1934, DeLong & Ross, 1 ♀.

### 93. *DOLERANUS* Ball

*Doleranus* Ball (1936, p. 58).

Head conical, venation simple but with central anteapical cell somewhat constricted, then enlarged before the apex. Vertex with a broken submarginal brown line. Three species are included in this genus, two of which are eastern and occur in Illinois.

#### KEY TO SPECIES

Green in color, without definite markings. . . . .  
Brownish yellow, marked with reddish brown . . . . .

2. *vividus*  
1. *longulus*

#### 1. *Doleranus longulus* (Gillette & Baker)

*Thamnotettix longulus* Gillette & Baker (1895, p. 97).

Length 5–6 mm. Brownish yellow, marked with reddish brown. Vertex obtusely angled, twice as wide as long; light fulvous, ocelli white, connected by a white transverse line; median longitudinal line and spot either side at base brown. Pronotum fulvous, marked with dark brown on anterior portion. Scutellum fulvous, disc paler. Elytra chestnut, nervures pale. Female seventh sternite with posterior margin depressed, slightly, angularly elevated. Male plates concavely rounded to the almost parallel-margined tips.

Common on herbaceous plants in open wooded areas, on wooded floodplains, and along stream banks, this species occurs in the eastern states and west to Iowa, Kansas, and Colorado.

**Illinois Records.**—Many males and females, taken March 27 to November 1, are from Aldridge, Carmi, Cave in Rock, Champaign, Charleston, Cobden, Dongola, Eichorn, Fountain Bluff, Grand Tower, Karnak, La Rue, Marshall, Monticello, Normal, Rock Island, Savoy, Urbana, Vienna, and White Heath.

### 2. *Doleranus vividus* (Crumb)

*Chlorotettix vivida* Crumb (1915, p. 197).

Length 5.5–6.0 mm. A distinctly angle-headed greenish species tinged with brown. Vertex one and one-half times as broad as long, almost twice as long at middle as next to eyes. Female seventh sternite with posterior margin broadly, triangularly notched half way to base, with a tooth at apex. Male plates, fig. 247, rather long, gradually narrowed three-fourths their length, then produced with almost parallel margins. Pygofer truncate posteriorly. Aedeagus in lateral view broad at base, narrowed to tapered bifurcate apex. Styles rather short, abruptly narrowed to finger-like apices.

A common species on grassy areas in meadows along streams, in valleys, and in open woodland, *vividus* occurs in the middle western and eastern states.

**Illinois Records.**—Many males and females, taken June 7 to November, are from Algonquin, Alton, Apple River Canyon State Park, Cave in Rock, Champaign, Danville, Dixon Springs, Dolson, Dubois, Elizabethtown, Fern Cliff, Golconda, Grafton, Havana, Herod, Jonesboro, Kampsville, Kankakee, Karnak, Lima, Monmouth, Monticello, Mount Carmel, Muncie, Normal, Oakwood, Olive Branch, Oquawka, Parker, Pike, Quincy, Rock Island, Thebes, Urbana, Ursa, Vienna, and White Pines Forest State Park.

### 94. *ATANUS* Oman

*Atanus* Oman (1937, p. 381).

Fig. 207. Vertex nearly flat, longer at middle than next to eyes, and bluntly angled. Head a little wider than pronotum. Forewing with simple venation, the second cross-vein lacking. The outer anteapical cell is short, with almost parallel sides, and is more slender than inner anteapical cell.

Only one of the two United States species belonging to this genus is known to occur in Illinois.

#### 1. *Atanus perspicillatus* (Osborn & Ball)

*Thamnotettix perspicillatus* Osborn & Ball (1897, p. 227).

Length 3.5–4.0 mm. A small gray species marked with black spots. Vertex creamy white, tinged with orange, two faint black

lines extending from apex to ocelli, basal half with a large fulvous crescent either side enclosing a white area. Pronotum gray; with broad faint longitudinal bands and a pair of spots behind each eye black. Scutellum pale, basal angles orange. Elytra milky, subhyaline, iridescent, with nine black spots. Vertex slightly longer at middle than next to eyes, a little wider at base than median length. Female seventh sternite broadly, angularly produced. Male valve short and broad; plates long, apices produced into pointed acute tips; a median black spot on each plate at base.

Occurring on herbaceous growth in wooded areas along streams, and in rich herbaceous areas, this species is distributed in parts of the East and Middle West.

**Illinois Records.**—DARWIN: July 23, 1932, Dozier & Park, 1 ♂. DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♂, 1 ♀. DOLSON: Rocky Branch, July 18, 1934, DeLong & Ross, 3 ♂; July 24, 1936, DeLong & Mohr, 3 ♀. HEROD: June 24, 1936, DeLong & Ross, 1 ♂. MOUNT CARMEL: July 3, 1906, 1 ♀. URBANA: sweeping, July 28, 1889, C. A. Hart, 1 ♂, 4 ♀; Aug. 27, 1916, 3 ♂, 5 ♀; Aug. 16–20, 1934, 3 ♂, 1 ♀. VIENNA: savanna grasses, June 14, 1934, DeLong & Ross, 1 ♂; July 29, 1934, DeLong & Ross, 1 ♂, 1 ♀.

## 95. *ELYMANA* DeLong

*Elymana* DeLong (1936a, p. 218).

This genus includes the more pointed-headed species previously included in *Thamnotettix*. Form usually long and slender, vertex sharply pointed or strongly and bluntly produced and acutely angled with front. Elytra long and narrow, venation as in *Thamnotettix*. Last sternite of male long, tapering to a pointed spinelike process. Aedeagus long, tapering to a long slender dorsally directed process. Base of aedeagus with dorsally extending process of various shapes.

DeLong (1936b) recorded five species of this genus for North America. One is known only from Arizona; the other four are eastern in distribution and all occur in Illinois, usually in wooded areas on *Elymus* and related grasses.

The species of the genus are closely related, and the females are very similar in the character of the seventh sternite, the posterior margin of which is usually sinuate.

## KEY TO SPECIES

1. Ninth segment of male produced into a sharp-pointed spine at apex. Spines on median dorsal portion visible in lateral view, directed caudad, as in figs. 461B, 461C.....2
- Ninth segment of male tapered, but blunt at apex, apical spines above apex of segment. Median dorsal spines not visible in lateral view, directed laterally into genital chamber, as in figs. 461A, 461D.....3
2. Styles of male, fig. 461B, constricted between bases and enlarged apices, which are sharp pointed on outer margins and slope outwardly.....1. *acrita*
- Styles, fig. 461C, constricted near bases and slightly tapered to almost truncate apices, which are not enlarged.....2. *acuma*

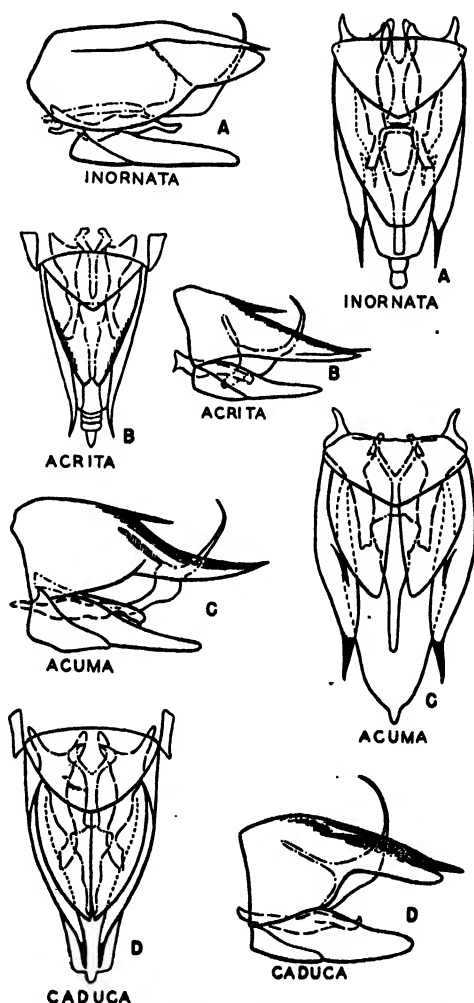


Fig. 461.—*Elymana*. A–D, mal: genitalia, ventral and lateral aspects.

3. Vertex almost rounded at apex, three-fifths as long as wide. Styles of male, fig. 461D, constricted near apices, then strongly curved outwardly, enlarged, and truncate on outer margins. ....

.....3. *caduca*  
Vertex more angled, three-fourths as long as wide. Styles, fig. 461A, constricted near apices but not enlarged, produced as parallel-sided apices directed slightly obliquely and truncate at apex. ....

.....4. *inornata*

### 1. *Elymana acrita* DeLong

*Elymana acrita* DeLong (1936b, p. 637).

Length 4.75–5.0 mm. Yellowish, with black ocelli, vertex sharply angled, almost as long as basal width between eyes. Female seventh sternite shallowly and roundedly emarginate, with a dark spot on either side of middle. Male ninth segment, fig. 461B, sloping to posterior spine, scarcely concave, anterior spine prominent. Styles in ventral view with outer margins sinuate and each tapered to a constricted portion anterior to an enlarged apical process, truncate at apex.

This species was described from Illinois, where it is abundant on *Elymus* grasses in shaded areas, on floodplains, and similar moist soils. It can easily be distinguished from the other members of the genus by characters of the male styles.

**Illinois Records.**—DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♀. ELIZABETHTOWN: June 25, 1932, Ross, Dozier, & Park, 1 ♂. GOLCONDA: June 22, 1932, Ross, Dozier, & Park, 1 ♀. HEROD: June 23, 1936, DeLong & Ross, 1 ♂. MONTICELLO: June 11, 1934, 3 ♂, 7 ♀. OQUAWKA: June 13, 1932, H. L. Dozier, 1 ♀.

### 2. *Elymana acuma* DeLong

*Elymana acuma* DeLong (1936b, p. 637).

Length 5 mm. Yellowish and with black ocelli, slightly larger than *acrita*. Vertex rather sharply angled, only slightly wider between eyes than length at middle. Female seventh sternite truncate, with heavy brown spots on either side of middle. Male ninth segment, fig. 461C, with anterior spine prominent in lateral view, the dorsal margin beyond this strongly and concavely rounded to form the posterior spine. Styles in ventral view rather short, not notched on outer margins, slightly and convexly rounded on inner margins; sides almost parallel, apices truncate.

This is a southern species, described from Tennessee, and is found on *Elymus* grasses in shady wooded areas.

**Illinois Records.**—DIXON SPRINGS: July 9, 1935, DeLong & Ross, 1 ♀. ELIZABETHTOWN: June 25, 1932, Ross, Dozier, & Park, 1 ♂. GOLCONDA: June 22, 1932, Ross, Dozier, & Park, 1 ♀. HEROD: June 24, 1936, DeLong & Ross, 1 ♂. OQUAWKA: June 13, 1932, Dozier, 1 ♀.

### 3. *Elymana caduca* DeLong

*Elymana caduca* DeLong (1936b, p. 638).

Length 5 mm. Yellow, tinged with green; ocelli black; veins of elytra paler than disc and conspicuous. Vertex bluntly angled, three-fifths as long as basal width. Female seventh sternite truncate or slightly emarginate. Male ninth segment, fig. 461D, strongly convex and rounded dorsally, anterior spine hidden in lateral view, extending inwardly; posterior spine prominent. Styles in ventral view rather deeply notched on outer margins, inner margins strongly convex and curved, apices turned outwardly, with pointed tips.

This is a common marsh species in northern Wisconsin and occurs at the margins of sphagnum bogs. It is found in similar habitats in northern Illinois.

**Illinois Records.**—BEACH: Aug. 7, 1935, DeLong & Ross, 1 ♀. VOLO: Aug. 24, 1935, DeLong & Ross, 6 ♀; Aug. 12, 1937, Burks & Ross, 1 ♀. WAUCONDA: July 23, 1934, DeLong & Ross, 1 ♀.

### 4. *Elymana inornata* (Van Duzee)

*Thamnotettix inornatus* Van Duzee (1892c, p. 303).

Length 5.0–5.5 mm. Dull yellow, tinged with green, bluntly angled. Vertex one-fourth wider between eyes than length at middle. Female seventh sternite almost truncate, a brown spot on either side of middle, producing notched appearance. Dorsal portion of male ninth segment, fig. 461A, convexly rounded to posterior spine; anterior spine extending inwardly and not visible in lateral view. Styles long, outer margins sloping inwardly to near apices, where they are notched, and the apices produced as short rather narrow parallel-margined and divergent processes.

This species is chiefly northern in distribution, occurring commonly at the margin

of the fresh-water marsh or similar moist areas.

**Illinois Records.**—Males and females, taken June 11 to November 10, are from Apple River Canyon State Park, Cave in Rock, Danville, Dolson, Herod, Kankakee, Marshall, Monticello, Oakwood, Shawneetown, and Urbana.

96. *CICADULA* Zetterstedt

*Cicadula* Zetterstedt (1838, col. 296).  
*Cyperana* DeLong (1936a, p. 218).

Fig. 462. This genus includes the common green leafhoppers of the *Thamnotettix* type, which occur in fresh-water marshes on *Cyperus*, similar sedges, and coarse grasses; they are characterized by having a bluntly angled vertex, which is usually produced, but in some species the apex is almost rounded. The elytra are long and narrow, with venation as in *Thamnotettix*. In most species of this genus, individuals are some shade of green or yellow, with a black band or a row of black spots on the margin of the vertex between the eyes.

The greater number of species of the genus occur only in the eastern United States, but some occur as far west as the Rocky Mountains. A few of the species are found only in the western United States. DeLong (1937d) recorded 13 species for the United States under the generic name *Cyperana*, and nearly half of these occur in Illinois.

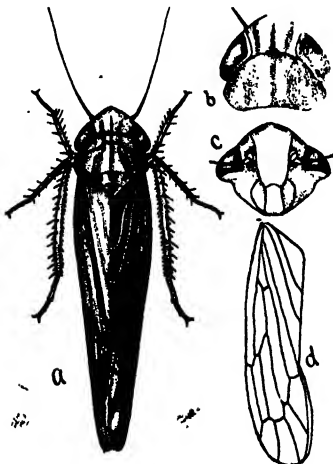


Fig. 462.—*Cicadula cyperacea*: a, adult; b, head and pronotum; c, face; d, elytron. (From Osborn.)

KEY TO SPECIES

1. Tawny or pale brown, longitudinally marked with brownish or reddish stripes; spots on vertex linear in form or forming a band, figs. 463A, 463B.....2
- Yellow or green, without longitudinal stripes.....3

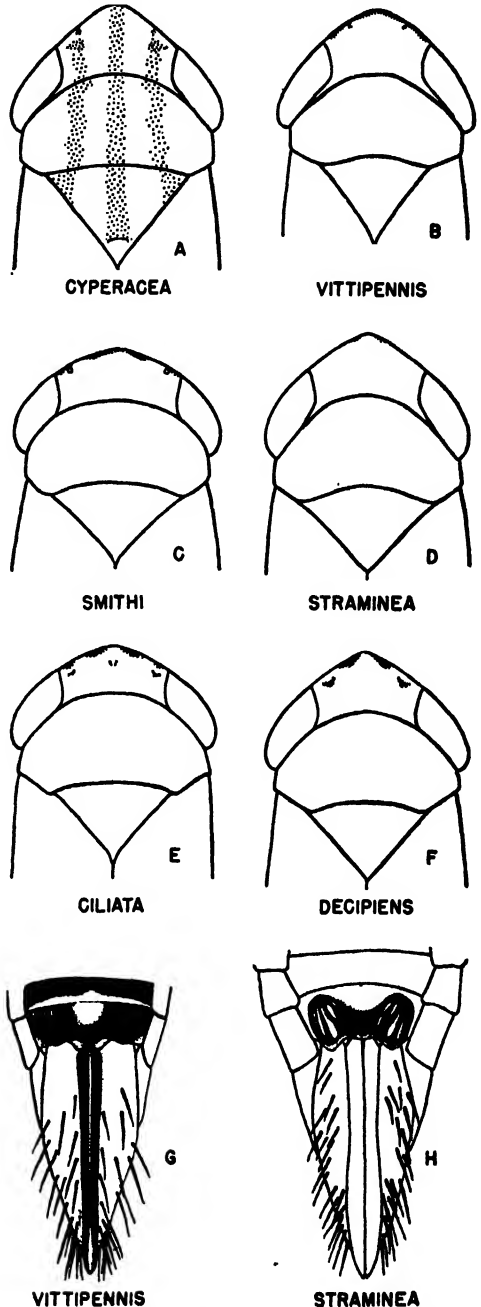


Fig. 463.—*Cicadula*. A-F, head and pronotum; G-H, female genitalia.

2. Vertex with four linear black spots on margin.....1. **cyperacea**  
Vertex with a black band on margin.....2. **vittipennis**
3. Length 6.5-7.0 mm.; pale yellow, with a pair of large black spots at apex of vertex and a pair of smaller spots next to eyes.....3. **straminea**  
Length not over 6.0 mm.; usually green or yellowish green.....4
4. Black coloration on margin of vertex forming band between eyes...4. **smithi**  
Black coloration on margin of vertex in the form of spots.....5
5. Four black spots on margin of vertex but without markings posterior to ocelli...6

- Markings on margin of vertex and also posterior to ocelli.....7
6. Each male plate, fig. 464A, deeply and concavely excavated on inner margin of apical third; each style tapered from base to apex.....5. **melanogaster**  
Each male plate, fig. 464E, sloping on inner margin, not concavely rounded; each style with a pair of finger-like processes at apex, an inner long one and an outer short one.....6. **ciliata**
7. Length 3.5-4.5 mm.; aedeagus, fig. 464C, short, not greatly enlarged at base; occurring in the western United States.....7. **longiseta**

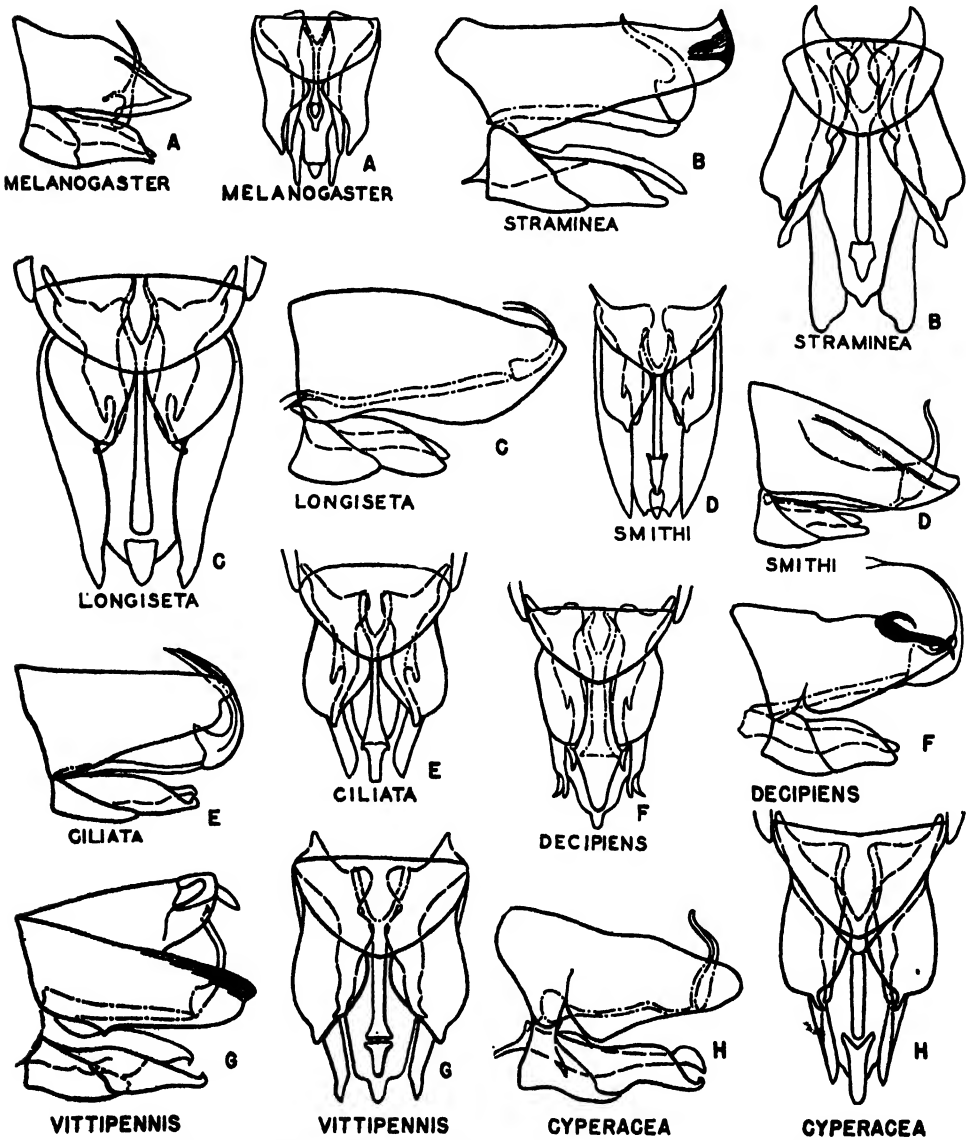


Fig. 464.—*Cicadula*. A-H, male genitalia, ventral and lateral aspects.

Length more than 4.5 mm.; aedeagus long, fig. 464F, large at base, apical two-thirds very slender; occurring in north-eastern United States. . . . 8. *decipiens*

### 1. *Cicadula cyperacea* (Osborn)

*Thamnotettix cyperaceus* Osborn (1898, p. 245).

Length 5.5–6.0 mm. Tawny, with orange or brownish longitudinal stripes and four black dashes on margin of vertex, fig. 463A, between the eyes. Vertex flat and bluntly angled, one-half wider between eyes at base than length at middle.

Female seventh sternite with lateral angles broadly rounded, posterior margin slightly, narrowly indented on either side of a broad median slightly produced tooth; median tooth about one-third width of sternite; a large round area on outer third of sternite composed of oblique ridges and striae. Male plates, fig. 464H, rather long and broad, each convexly rounded to blunt apex, where it bears a rather long incurved finger-like process. Each style long, broad on basal half, then rather rapidly narrowed to slender apical processes, which are produced half the length of style. Aedeagus rather small, slightly enlarged at base, apical portion narrowed, produced dorsally, and curved anteriorly.

This species is commonly found in the fresh-water marsh of the northern states in *Cyperus* habitats. It is a fairly common species in the marshes of northern Illinois, and closely resembles *vittipennis*, which is found in the same general type of habitat.

**Illinois Records.**—ANTIOCH: July 5–7, 1932, T. H. Frison, 1 ♂. FOX LAKE: June 30, 1935, DeLong & Ross, 4 ♂, 6 ♀. ORANGEVILLE: Aug. 28, 1934, Frison & DeLong, 1 ♂, 1 nymph. URBANA: June 2, 1890, C. A. Hart, 1 ♂. VOLO: July 16, 1935, DeLong & Ross, 3 ♂, 1 ♀; in bog, Aug. 24, 1935, DeLong & Ross, 2 ♂, 2 ♀.

### 2. *Cicadula vittipennis* (Sanders & DeLong)

*Thamnotettix vittipennis* Sanders & DeLong (1917, p. 91).

Length 5.5–6.0 mm. Tawny, with elytra appearing white striped. Vertex, fig. 463B, with a black marginal stripe between eyes, and a tawny band covering disc and extending to eyes. Vertex bluntly angled, twice as wide between eyes as length at

middle. Female seventh sternite, fig. 463G, with posterior margin slightly emarginate and narrowly notched on either side of middle; outer third striated as in *cyperacea*. Male plates, fig. 464G, short and broad, convexly rounded on each outer margin, and strongly sloping on inner margin to form a blunt toothlike structure at apex. Styles long, sinuately tapered from bases and curving outwardly to form blunt apices, pointed on outer margins. Plates decidedly longer than styles. Aedeagus slender, slightly enlarged at base, normally directed dorsally, curved slightly caudally at middle.

This species has been collected only in northern Wisconsin from the tall grass and sedge habitat of the fresh-water marsh.

### 3. *Cicadula straminea* (Sanders & DeLong)

*Thamnotettix stramineus* Sanders & DeLong (1917, p. 90).

Length 6.5–7.0 mm. Large, yellow, with four transverse black spots on margin of vertex, fig. 463D, the inner spots large, the outer two small. Vertex almost twice as broad as median length, bluntly angled. Female seventh sternite, fig. 463H, with outer angles forming broadly rounded lobes, between which the posterior margin is shallowly and concavely rounded; outer third of segment on either side black, with prominent oblique ridges and striae. Male plates, fig. 464B, short, each gradually narrowed on inner margin and convexly rounded on outer to form a prominent pointed projection at apex. Styles long and slender, tapering and slightly constricted just before bluntly pointed apices.

This species inhabits the sedges of the northern marsh areas and may occur in northern Illinois.

### 4. *Cicadula smithi* (Van Duzee)

*Thamnotettix smithi* Van Duzee (1892b, p. 266).

Length 5 mm. Green, tinged with yellow, and with a broad black band on margin of vertex, fig. 463C, between the eyes; vertex broadly rounded, almost parallel margined, twice as wide between eyes as length at middle; elytra green, apices smoky. Female seventh sternite with lateral angles broadly rounded, posterior margin slightly



emarginate on either side of a broad slightly produced median tooth, which is produced almost as far as the rounded lateral angles. Each male plate, fig. 464D, short, sides convexly rounded to blunt apex, with a short blunt toothlike projection. Each style rather long, narrowed at about one-third its length and produced to form a spurlike tooth on outer margin and an elongated rather broad finger-like process on inner margin, process blunt at apex. Aedeagus rather short, enlarged at base, narrowed at about half its length to form a slender apical process, which is directed dorsally.

A species occurring in the fresh-water marsh on *Spartina michauxiana*, *smithi* is recorded from the eastern states and the Middle West.

**Illinois Records.**—CHAMPAIGN: at light, June 12, 1888, 1 ♀. FOX LAKE: June 30, 1935, DeLong & Ross, 1 ♂; June 26, 1936, Frison & DeLong, 4 ♂, 8 ♀. FULTON: July 4, 1936, DeLong & Burks, 1 ♀. PRINCETON: in swamp, July 7, 1934, DeLong & Ross, 1 ♀; July 2, 1936, B. D. Burks, 1 ♀. SUMMIT: Aug. 21, 1935, DeLong & Ross, 1 ♂.

##### 5. *Cicadula melanogaster* (Provancher)

*Jassus melanogaster* Provancher (1872, p. 378).

Length 5.0–5.5 mm. Greenish or yellowish, with four large black spots in a row on the margin of vertex; vertex bluntly angled, one-half wider between eyes than length at middle. Female seventh sternite with a sinuate posterior margin that is broadly and shallowly emarginate. Male plates, fig. 464A, abruptly and concavely narrowed on inner margins to produced bluntly pointed apices. Styles long and slender, narrowed near bases and produced into long tapering processes with bluntly pointed apices. Aedeagus long, slender, and usually directed dorsally; basal portion a little thicker and with anterior process; apical portion slender and pointed at tip.

This is the most common species of the genus and occurs in the fresh-water marsh of the northern United States. It is found commonly throughout Illinois.

**Illinois Records.**—Many males and females, taken June 5 to November 17, are from Algonquin, Amboy, Antioch, Atlas, Aurora, Beach, Champaign, Des Plaines, Freeport, Fox Lake, Fulton, Harrisburg,

Havana, Humboldt, Loda, Macomb, New Milford, Ogden, Oquawka, Orangeville, Oregon, Princeton, Round Lake, St. Anne, Seymour, Shawneetown, Spring Valley, Urbana, Vienna, Volo, Warren, Wauconda, and Zion.

##### 6. *Cicadula ciliata* (Osborn)

*Thamnotettix ciliatus* Osborn (1898, p. 244).

Length 5.0–5.5 mm. Green, tinged with yellow, and with four black spots on margin of vertex, fig. 463E. Vertex blunt, almost twice as wide between eyes at base as length at middle. The margin of the female seventh sternite is broadly and shallowly emarginate. Each male plate, fig. 464E, short and broad, strongly and convexly rounded on outer margin, and strongly sloping on inner margin to a blunt apex with a slight toothlike projection. Aedeagus broad at base, constricted and produced dorsally and anteriorly as a wide blade-like structure that is pointed at apex.

This species occurs on sedges in fresh-water marshes throughout the northern United States.

**Illinois Records.**—ALGONQUIN: Aug. 13, 1895, 1 ♂; Sept. 15, 1895, 1 ♂, Oct. 3, 1895, 1 ♂. AMBOY: Aug. 8, 1934, DeLong & Ross, 1 ♂. ELIZABETH: July 7, 1917, 1 ♂. FOURTH LAKE: Aug. 7, 1887, 1 ♂. GRAYS LAKE: June 10, 1936, Ross & Burks, 1 ♀. HUMBOLDT: Nov. 1, 1931, H. H. Ross, 1 ♂, 2 ♀. ORANGEVILLE: Aug. 28, 1934, DeLong & Frison, 1 ♀. SAVANNA: June 14, 1917, 2 ♀. URBANA: Oct. 4, 1909, 2 ♀; Nov. 10, 1915, 1 ♀.

##### 7. *Cicadula longiseta* (Van Duzee)

*Thamnotettix longiseta* Van Duzee (1892b, p. 266).

Length 3.5–4.5 mm. Resembling *melanogaster* somewhat in coloration but with a broad blunt head and a pair of tiny spots back of ocelli in addition to the four on the anterior margin of vertex. Vertex bluntly angled, two-fifths wider between eyes than length at middle. Female seventh sternite sinuate and almost truncate, with posterior margin slightly concave. Each male plate, fig. 464C, short and broad, strongly and convexly rounded on outer and inner margins to form a bluntly pointed apex. Style narrowed gradually from base to form a

long finger-like process on each inner margin, which is strongly curved outwardly, and a much shorter process on outer margin, about one-third the length of the inner process. Aedeagus only slightly enlarged at base, curved dorsally and anteriorly about as far as base, apex bifid.

This is a common species of the genus in the northwestern United States and may occur in western Illinois.

#### 8. *Cicadula decipiens* (Provancher)

*Thamnotettix decipiens* Provancher (1890, p. 285).

Length 4.5–5.0 mm. Yellow, tinged with green, with four black spots on vertex, fig. 463F, a large one on either side of blunt apex on margin, and one on either side above margin and posterior to ocellus; vertex blunt, almost twice as wide between eyes at base as length at middle. Female seventh sternite with lateral angles rather well produced, between which the posterior margin is sinuately and concavely emarginate more than one-third the distance to base; a very short white blunt tooth at apex of emargination. Male plates, fig. 464F, rather broad and short, convexly rounded to blunt apices. Styles long and narrow, inner margin of each produced into a long curved finger-like process, outer margin with a very short spur only. Aedeagus large at base, rapidly constricted to a very slender apical portion, which is long, curves dorsally and anteriorly, and is bifid at apex. A large black bifurcate spine is on the dorso-caudal portion of each pygofer.

This is a transcontinental species found in the fresh-water marsh on sedges.

**Illinois Records.**—ANTIOCH: Aug. 24, 1935, DeLong & Ross, 1 ♀. FOX LAKE: June 30, 1935, DeLong & Ross, 1 ♀. PRINCETON: swamp, July 7, 1934, DeLong & Ross, 1 ♂. SUMMIT: Aug. 21, 1935, DeLong & Ross, 1 ♂.

#### 97. *PALUDA* DeLong

*Paluda* DeLong (1937d, p. 233).

Fig. 244. The genus is related to *Cicadula* and can be distinguished by a dorsal blunt tooth on the posterior margin of each male plate; the apices of the pygofers terminate in bladelike structures that are produced the length of the segment beyond

its apex and directed dorsally and caudally. The aedeagus is different in type, composed of a broad basal portion and a short narrow apical process. The absence of black spots on the margin of the vertex also separates this genus from *Cicadula*.

Two species have been placed in this genus. One of them is known only from California; the other is chiefly eastern.

#### 1. *Paluda mella* (Sanders & DeLong)

*Thamnotettix mellus* Sanders & DeLong (1917, p. 91).

*Thamnotettix placidus* Osborn (1905b, p. 536). Name preoccupied.

*Thamnotettix placatus* Baker (1924, p. 367). New name for *placidus*.

Length 5 mm. Small, orange yellow, with vertex broadly rounded, almost twice as wide between eyes as length at middle. Female seventh sternite with rather prominent lateral angles, between which the posterior margin is rather broadly excavated about one-third the distance to base; sides of excavated portion slightly convex, apex rather broad, with a slightly produced rounded tooth at center. Male plates, fig. 244, rather long, gradually and evenly narrowed to bluntly angled apices. Each style sinuately and gradually narrowed from a broad base to outwardly directed and bluntly pointed apex. Aedeagus broad on basal two-thirds, then rapidly narrowed to a slender apical third, which is directed dorsally. Apical portion of each pygofer narrowed into bladelike structure, which is strongly produced caudally and dorsally the length of the pygofer proper.

This species is northern in distribution and apparently inhabits the area occupied by the northern conifer forest. Although apparently having a more northern range than Illinois, it may at some time be found in the extreme northern part of the state.

#### 98. *IDIODONUS* Ball

*Idiodonus* Ball (1936, p. 57).

Fig. 235B. Head narrower than pronotum, vertex short, blunt, obtusely rounded, and rounded to front. Elytra long, venation simple, with one crossvein. Female seventh sternite produced on posterior margin and with a slight median incision.

DeLong & Knull (1945) recorded 21 species and several varieties of this genus

for the United States. Only two are known to occur in Illinois.

#### KEY TO SPECIES

- Length 6.0 mm. or more; claval vein conspicuously pale in color. . . . . 1. *kennicotti*  
 Length not over 5.75 mm.; reddish brown in color, claval vein not conspicuous. . . . . 2. *brittoni*

#### 1. *Idiodonus kennicotti* (Uhler)

*Jassus kennicotti* Uhler (1863, p 161).

Length 6.0–6.5 mm. Fulvous, vertex dirty yellow, with red ocelli, two large, black spots between them; a pale transverse band at base fulvous. Vertex one-half longer at apex than next to eyes, twice as broad as long. Face dirty yellow. Pronotum with posterior margin and a median transverse band yellow. Elytral nervures lighter than disc, costal and apical areas yellowish hyaline; a broad conspicuous stripe on outer claval vein yellowish. Female seventh sternite, fig. 235*B*, with roundedly produced posterior margin slightly incised and keeled and with a brown spot at center. Male valve short and broad. Plates long, broad at bases, lateral margins concave, tips produced and pointed.

Usually found on oak and other shrubby plants or on tall herbaceous plants in shrubby areas, this species ranges from the eastern United States westward to British Columbia.

**Illinois Records.**—Many males and females, taken May 7 to October 1, are from Apple River Canyon State Park, Cobden, Dixon Springs, Dolson, Dubois, Elizabethtown, Galena, Golconda, Herod, Kankakee, Lawrenceville, Mason City, Muncie, Palos Park, Shawneetown, Temple Hill, Urbana, Vienna, and White Heath.

#### 2. *Idiodonus brittoni* (Osborn)

*Thamnotettix brittoni* Osborn (1907, p. 166).

Length 5.0–5.75 mm. Reddish brown, vertex yellowish, ocelli red and with two black spots between ocelli. Vertex one-third longer at middle than next to eyes. Clavus of each elytron with pale stripe, veins pale, sutural line reddish. Males often golden tinted. Yellow markings absent. Female seventh sternite with posterior margin rounded, slightly notched at center. Male

valve short, plates concave on outer margins, apexes narrow.

Previously recorded from the eastern part of the United States, this species usually occurs on shrubs; it is not found in great abundance.

**Illinois Records.**—DUBOIS: Aug. 8, 1917, 1 ♀; Aug. 9, 1917, 1 ♀. ELIZABETHTOWN: May 22–24, 1932, Ross, Dozier, & Park, 1 ♀. GRAFTON: along river, June 26, 1934, DeLong & Ross, 1 ♂. KARNAK: Aug. 8, 1934, Ross, DeLong, & Mohr, 1 ♂, 1 ♀. MONTICELLO: June 11, 1934, 2 ♂. MUNCIE: Sept. 20, 1935, Frison & Mohr, 1 ♂. OAK LAWN: in lamp globe, Aug. 22, 1934, DeLong & Ross, 1 ♂. PULASKI: May 25, 1932, H. L. Dozier, 1 ♀. VIENNA: savanna grasses, June 14, 1934, DeLong & Ross, 1 ♀; July 29, 1934, DeLong & Ross, 1 ♀.

#### 99. *COLLADONUS* Ball

*Colladonus* Ball (1936, p. 57).

Fig. 465. Head conical, much narrower than pronotum, longer and more pointed. Elytra appressed posteriorly. Female seventh sternite with a strap-shaped or spatulate median projection. Male plates together spoon shaped.

DeLong & Knull (1945) listed 21 species and 3 varieties in this genus for the United States. Two species have been taken in Illinois, and at least one other may occur here.

#### KEY TO SPECIES

1. Vertex with two round black spots on margin; elytra black or dark brown, with a yellow saddle area. . . . . 2  
 Vertex without black spots on margin; elytra paler in color. . . . . 1. *eburatus*
2. Female seventh sternite, fig. 234*B*, with rounded lateral lobes that are not notched. . . . . 2. *clitellarius*  
 Female seventh sternite with lateral lobes decidedly notched posteriorly. . . . . 3. *furculatus*

#### 1. *Colladonus eburatus* (Van Duzee)

*Thamnotettix eburata* Van Duzee (1889*a*, p. 10).

Length 6 mm. Paler in color than *clitellarius* but with the same general pattern. Vertex decidedly produced and bluntly angled, yellow without dark markings. Pronotum, scutellum, and elytra pale brown. Each clavus pale yellow, except anterior

fourth and apexes; outer claval vein conspicuously dark brown and apex brownish. Female seventh sternite with broadly rounded lateral lobes; posterior margin deeply excavated on either side of a long

gola, Eldorado, Elizabethtown, Fox Lake, Fulton, Galena, Grafton, Grand Tower, Grays Lake, Havana, Iroquois, Kampsville, Kankakee, Karnak, Keithsburg, La Grange, Lima, Mahomet, Makanda, Meredosia,

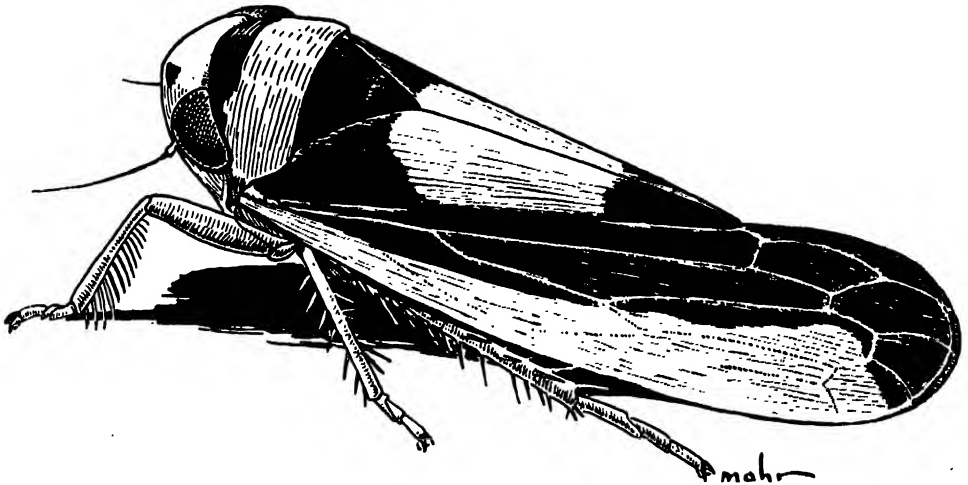


Fig. 465.—*Colladonus clitellarius*.

median spatulate process. Male valve triangular, plates long, slightly and convexly rounded to pointed apexes.

This is a northern species occurring in small numbers in wooded areas.

## 2. *Colladonus clitellarius* (Say)

*Jassus clitellarius* Say (1831, p. 309).

Length 5.0–5.5 mm. Brown, with yellow oval saddle spot involving clavus of each elytron, costal area yellowish. Vertex bright yellow, with two large round black spots on apex between ocelli; short and broad, one-fourth longer at middle than next to eyes. Pronotum with a broad brown band on anterior third. Female seventh sternite, fig. 234B, with posterior margin broadly excavated half way to base and with a median tooth produced beyond the lateral lobes. Male plates rather short, apexes bluntly rounded.

Abundant and widely distributed in eastern and middle western states, this species apparently occurs on both shrubs and herbs.

**Illinois Records.**—Many males and females, taken May 19 to October 28, are from Algonquin, Alton, Amboy, Antioch, Apple River Canyon State Park, Atlas, Bradley, Byron, Cave in Rock, Champaign, Chemung, Des Plaines, Dixon, Dolson, Don-

Monticello, Mount Carmel, Muncie, New Holland, New Milford, Oak Lawn, Onarga, Oquawka, Oregon, Pike, Pulaski, Quincy, Round Lake, St. Anne, Savanna, Seymour, Shawneetown, Springfield, Starved Rock State Park, Urbana, Vienna, Volo, Warren, White Pines Forest State Park, Wilington, and Zion.

## 3. *Colladonus furculatus* (Osborn)

*Thamnotettix furculatus* Osborn (1905a, p. 275).

Length 5 mm. Distinguished from *clitellarius* by the posteriorly notched lateral lobes of the seventh sternite of female. Vertex roundedly produced, yellow, with a pair of large black spots at apex. Posterior margin of vertex and anterior portion of pronotum between eyes brown. Scutellum and elytra brown. A pale transparent margin on costa, an oval spot on each clavus yellow. Male plates almost straight margined, acutely angled at apexes.

This is usually considered a rather rare species and is found only in small numbers in wooded areas. It has previously been recorded from Pennsylvania and Ohio.

**Illinois Record.**—APPLE RIVER CANYON STATE PARK: Aug. 27, 1934, Frison & DeLong, 1 ♀.

100. *DAVISONIA* Dorst

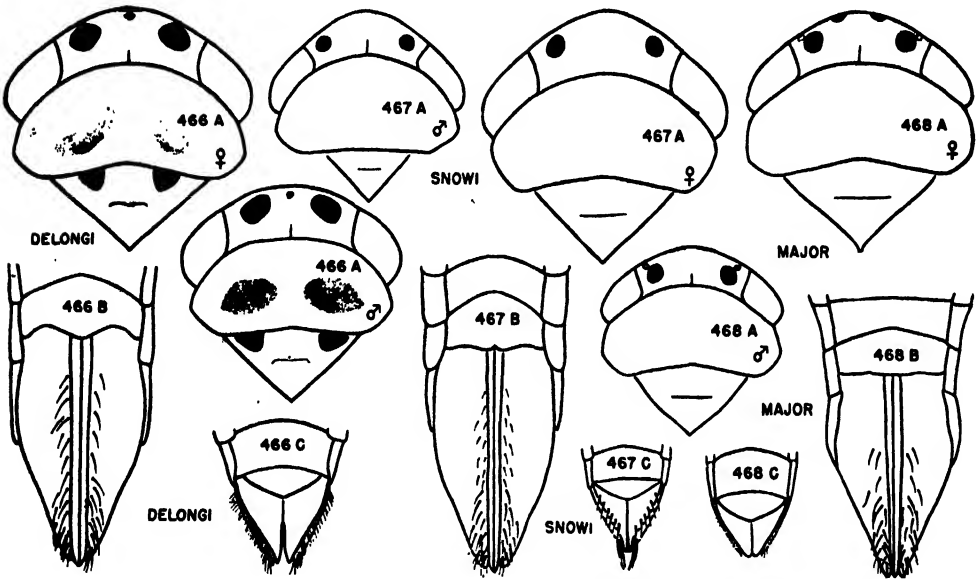
*Davisonia* Dorst (1937, p. 4).

Fig. 213. Vertex transverse and almost parallel margined, broadly rounded to front, front broad. Pronotum broad. Elytra long and broad, slightly narrowed apically, each with two anteapical and four apical cells; posterior wings with three apical cells. Male pygofers without caudoventral lobes. Stem of connective twice as long as arms on internal genitalia.

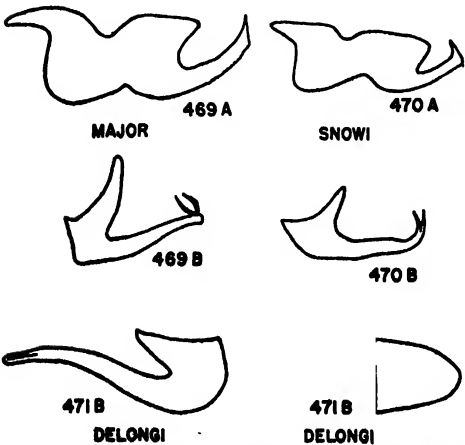
Four species are recorded by Dorst (1937) for the United States, and three of these have been taken in Illinois.

KEY TO SPECIES

1. Vertex almost parallel margined; length 4.5–7.0 mm. .... 2  
Vertex, fig. 467, slightly but distinctly longer at middle than next to eyes; length 4.0–5.0 mm. .... 1. *snowi*
2. Female seventh sternite, fig. 468*B*, almost truncate; two small brown spots near apex of vertex, fig. 468*A*. .... 2. *major*



Figs. 466–468.—*Davisonia*. A, head and pronotum; B, female genitalia; C, male external genitalia. (After Dorst.)



Figs. 469–471.—*Davisonia*, male genitalia. A, style; B, aedeagus in lateral or ventral aspect. (After Dorst.)

Female seventh sternite, fig. 466*B*, with a broad produced median lobe; spot near apex of vertex, fig. 466*A*. .... 3. *delongi*

1. *Davisonia snowi* (Dorst)

*Cicadula snowi* Dorst (1931, p. 41).

Length 4–5 mm. Not as robust as *major*, with vertex more produced, bluntly angled. Yellowish, vertex, fig. 467*A*, with two black spots, one back of each ocellus; elytra whitish hyaline, nervures pale. Female seventh sternite, fig. 467*B*, almost truncate, with a median small shallow V-shaped notch. Male plates, fig. 467*C*, more elongate, apices slender, appearing attenuated. Male aedeagus, fig. 470*B*, terminating in two short finger-like processes compressed dorsoventrally and ending in sharp points. Styles as in fig. 470*A*.

Known only from *Salix*, this species is found in the middle western region of the United States and west to Montana and Colorado.

**Illinois Record.**—PIKE: Mississippi flood plain, June 28, 1934, DeLong & Ross, 1 ♀.

## 2. *Davisonia major* (Dorst)

*Cicadula major* Dorst (1931, p. 43).

Length 5–7 mm. Large and robust, yellow, with two large rounded spots on vertex, back of ocelli, fig. 468A, and often with two smaller proximal spots on the margin. Elytra often with grayish stripes. Vertex slightly longer at middle than next to eyes, broadly rounded on anterior margin and broadly rounding to front. Female seventh sternite, fig. 468B, almost truncate, posterior margin slightly produced at middle. Male plates, fig. 468C, short and rather broad, apices bluntly angled. Aedeagus, fig. 469B, with two short curved processes near apex. Styles as in fig. 469A.

This species occurs on *Salix* in the eastern United States and west to Colorado.

**Illinois Records.**—Males and females, taken June 9 to August 8, are from Alton, Fulton, Grafton, Grand Tower, Havana, Kampsville, Kankakee, Metropolis, New Milford, Pike, Prophetstown, Quincy, Shawneetown, and Warsaw.

## 3. *Davisonia delongi* Dorst

*Davisonia delongi* Dorst (1937, p. 6).

Length 4.5–5.5 mm. Not as robust as *major*, but similarly marked. Vertex, fig. 466A, yellowish, with two large black spots near anterior margin and a smaller black or brown spot near apex; vertex almost parallel margined. Female seventh sternite, fig. 466B, with posterior margin emarginate on either side of a median broad slightly produced tooth; lateral angles produced. Male plates, fig. 466C, broad, triangular, apices acutely pointed. Aedeagus, fig. 471B, large, bluntly pointed, with two small triangular plates along shaft at apex.

Occurring on *Salix*, this species is distributed in the eastern United States through the Middle West to New Mexico.

**Illinois Records.**—Many males and females, taken June 10 to August 24, are from Algonquin, Apple River Canyon State Park, Centerville, Champaign, Kankakee, Ma-

homet, Metropolis, Monticello, Mount Carmel, New Milford, Urbana, Waukegan, and West Union.

## 101. *SONRONIUS* Dorst

*Sonronius* Dorst (1937, p. 9).

Wing venation as in *Davisonia* and *Macrosteles*. Each male pygofer with a slight caudoventral notch. Male genital connective stem one and one-half times as long as arms.

Dorst (1937) records three species of this genus, only one of which is known to occur in Illinois.

### 1. *Sonronius clavatus* (DeLong & Davidson)

*Cicadula clavata* DeLong & Davidson (1934, p. 223).

Length 4 mm. Golden yellow, marked with black. Vertex bluntly produced, with a pair of large round black spots just above margin. Pronotum unmarked. Elytra with each clavus dark brown, apical third dark, smoky to brown. Face yellow. Female seventh sternite with posterior margin roundedly produced, almost truncate. Male plates triangular, produced into elongate upturned apices.

This species is very strikingly marked. Nothing is known concerning its biology or food plant. It was described from a small series of specimens from New Jersey and it may represent an importation. It has more recently been found in northern Illinois, but the record is based upon a single specimen.

**Illinois Record.**—ANTIOCH: July 5–7, 1932, 1 ♂.

## 102. *MACROSTELES* Fieber

*Macrosteles* Fieber (1866, p. 504).

Fig. 245B. Vertex longer at middle than next to eyes, bluntly angled. Pronotum short. Elytra long, exceeding the abdomen, the two overlapping apically, each with a distinct appendix, two anteapical cells, and four apical cells. Each hind wing with three closed apical cells. Male plate with attenuated finger-like process. Male pygofers with distinct caudoventral processes. Male aedeagus with two finger-like apical processes. Connective with stem about equal to arms in length.

Sixteen species of *Macrosteles* are recorded by Dorst (1937) for the United States, and six of these are known to occur in Illinois.

#### KEY TO SPECIES

1. Length not more than 2.5 mm. .... 1. *potoria*  
Length more than 3.0 mm. .... 2
2. Spots on vertex, fig. 477*A*, convergent,  
not distinct. .... 2. *slossoni*  
Spots on vertex distinct, usually not con-  
tiguous. .... 3
3. Vertex, fig. 476*A*, with three distinct pairs  
of spots arranged in two rows. .... 3. *divisa*  
Vertex with one or two pairs of spots in  
addition to spots next to eyes. .... 4
4. Vertex, fig. 475*A*, with a pair of spots just  
back of ocelli and none between ocelli  
on margin. .... 4. *binotata*  
Vertex with a pair of spots back of ocelli  
and another pair between ocelli on  
margin. .... 5
5. A pair of spots between ocelli and eyes,  
fig. 472*A*. .... 5. *leptoda*  
Without spots next to eyes, fig. 473*A*. .... 6. *variata*

#### 1. *Macrosteles potoria* (Ball)

*Cicadula potoria* Ball (1900c, p. 346).

Length 2.0–2.5 mm. Very small, black, with a sharply angled vertex. Vertex, pronotum, and scutellum heavily marked with black. Vertex, fig. 474*A*, usually black, with an oblique white spot on either side of a central white stripe, which terminates in a white posterior portion; often entire vertex black. Elytra subhyaline, nervures dark. Female seventh sternite, fig. 474*B*, slightly emarginate at middle. Male plates, fig. 474*C*, very short, apexes sharply pointed and attenuate. Aedeagus, fig. 480*B*, terminating in two slender processes that are crossed and directed laterally. Styles as in fig. 480*C*.

A common species on wet areas of ponds and lagoons on a fine mat of *Eleocharis*, *potoria* is recorded principally from the eastern states.

**Illinois Record.**—BEACH: July 25, 1934, Frison & DeLong, 4♂, 12♀.

#### 2. *Macrosteles slossoni* (Van Duzee)

*Cicadula slossoni* Van Duzee (1893, p. 281).

Length 3.5–4.0 mm. Smaller than *divisa* and with darker markings. Vertex, fig. 477*A*, bluntly angled, with three pairs of black spots and another next to either eye

usually converging into a curiously shaped black picture. Pronotum and scutellum variously marked with black. Female seventh sternite, fig. 477*B*, truncate, posterior margin slightly sinuate. Male plates, fig. 477*C*, triangular, with pointed attenuated apexes, which are slightly divergent. Aedeagus, figs. 478*A*, 478*B*, similar to that of *divisa*, terminating in two finger-like processes, which are directed caudally. Style as in fig. 478*C*.

A common transcontinental species in marshes and at the margins of swamps, *slossoni* occurs on small vegetation associated with species of *Eleocharis*.

**Illinois Record.**—MCHENRY: July 27, 1934, DeLong & Ross, 4♀.

#### 3. *Macrosteles divisa* (Uhler)

*Jassus divisus* Uhler (1877, p. 472).

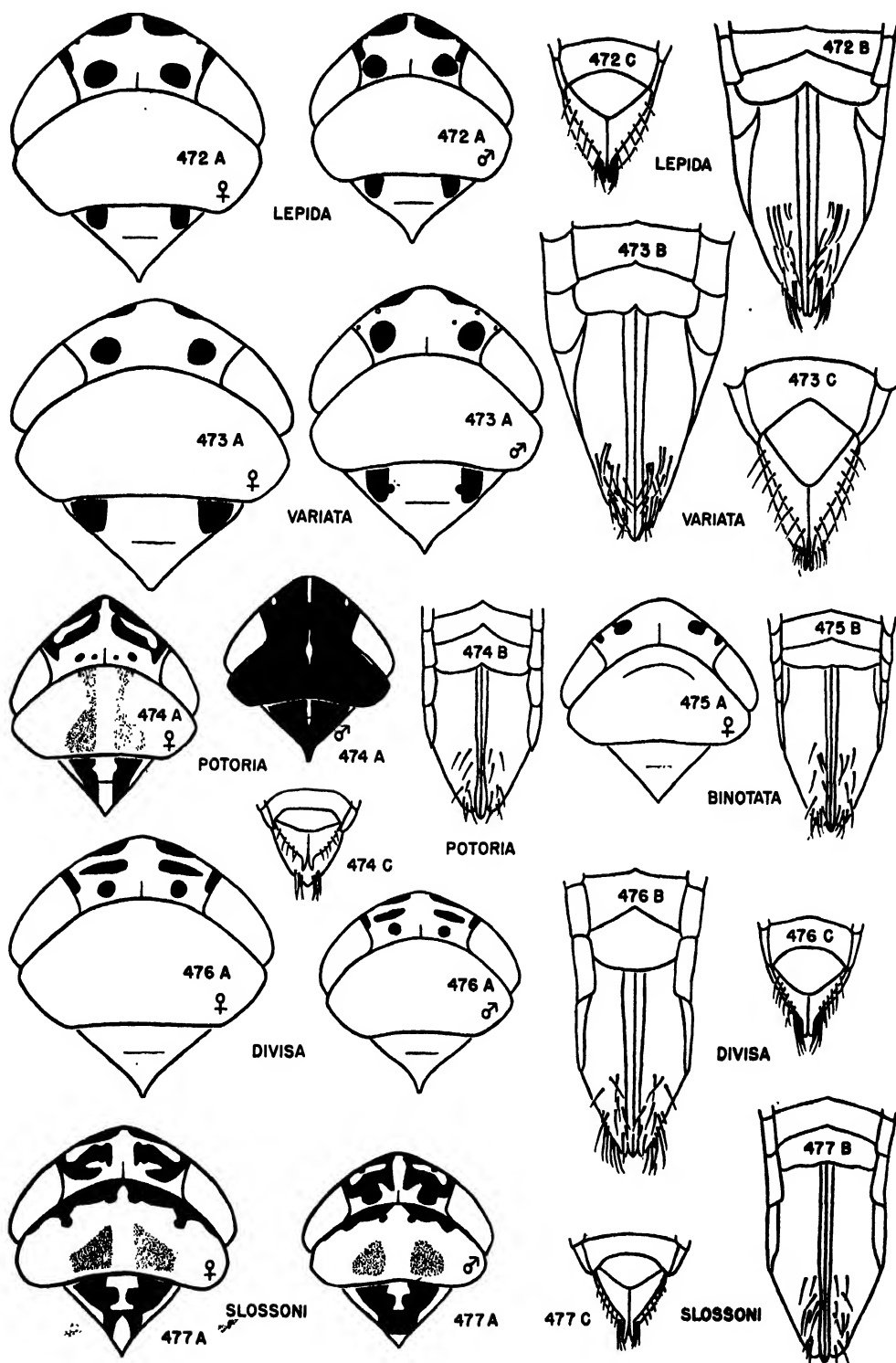
*Cicada sexnotata* Fallen (1806, p. 34). (American records cited in error.)

*Cicadula quadrilineatus* Forbes (1885, p. 68).

Length 3.5–4.5 mm. Greenish yellow, with three pairs of spots or transverse dashes on vertex, fig. 476*A*, the pair of spots on margin and the pair on disc of vertex usually transverse, the posterior pair usually round. There is usually a spot next to each eye. Vertex bluntly produced and rounded to front. Female seventh sternite, fig. 476*B*, with posterior margin truncate or roundedly produced. Male plates, fig. 476*C*, short, triangular, apexes acutely pointed and attenuated. Aedeagus, figs. 481*A*, 481*B*, terminating in two finger-like processes that are produced caudally and pointed at apexes. Styles as in fig. 481*C*.

This species is the most common and important of the genus and is common upon many economic plants throughout the United States. It is variable in size and intensity of color markings.

**Illinois Records.**—Many males and females, taken April 15 to October 30, are from Algonquin, Alsip, Alton, Alto Pass, Antioch, Apple River Canyon State Park, Aurora, Barry, Beach, Bradley, Buda, Bushnell, Cache, Cairo, Carbondale, Carman, Cedar Lake, Champaign, Chemung, Decatur, Des Plaines, Dixon Springs, Du Bois, East St. Louis, Evergreen Park, Fox Lake, Fulton, Geff, Gibson City, Grafton, Grays Lake, Harrisburg, Harvard, Havana, Herod, Homer, Horseshoe Lake, Ingleside,



Figs. 472-477.—*Macrosteles*. A, head and pronotum; B, female genitalia; C, male external genitalia. (After Dorst.)

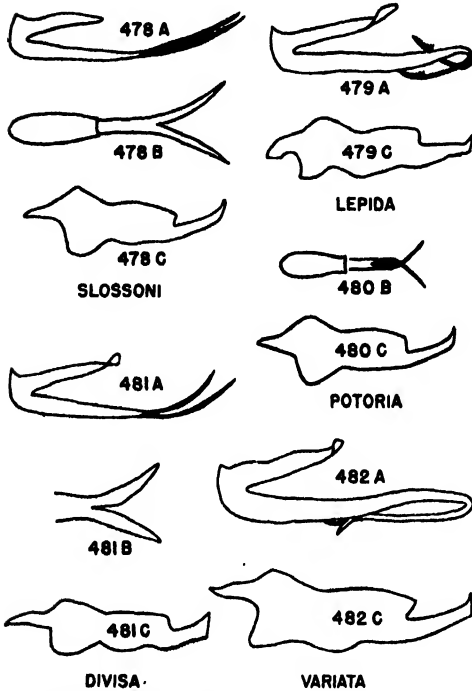


Kampsville, Kankakee, Karnak, Kirkwood, Lake Villa, Lawrenceville, L'Erable, Lima, Luther, Mahomet, Manteno, McHenry, Meredosia, Metropolis, Mokena, Momence, Monmouth, Monticello, Mount Carmel, Mount Sterling, New Holland, Niota,

seventh sternite, fig. 475B, with posterior margin slightly sinuate, almost truncate.

This species is recorded from Ontario, Maine, and Illinois. Only one female has been taken in this state.

Illinois Record.—WAUKEGAN: July 6, 1932, 1 ♀.



Figs. 478-482.—*Macrosteles*, male genitalia. A, lateral aspect of aedeagus; B, ventral aspect of aedeagus; C, style.

Normal, Norris City, Oak Lawn, Oakwood, Oquawka, Ottawa, Palos Park, Pankeyville, Pecatonica, Pike, Port Byron, Princeton, Putnam, Quincy, Quiver Lake, Rantoul, Rock Island, St. Anne, Savanna, Shawneetown, Sheffield, Sparta, Springfield, Spring Valley, Starved Rock State Park, Summit, Thomson, Topeka, Urbana, Ursa, Vandalia, Vienna, Volo, Wauconda, Waukegan, and Zion.

#### 4. *Macrosteles binotata* (Sahlberg)

*Limotettix binotata* Sahlberg (1871, p. 242).  
*Cicadula suffusa* Osborn (1915, p. 146).

Length 5 mm. Similar to *variata*; vertex, fig. 475A, bluntly and angularly produced. Vertex and frons orange yellow, vertex with two black spots just above ocelli and a smaller spot next to each eye. Female

#### 5. *Macrosteles lepida* (Van Duzee)

*Cicadula lepida* Van Duzee (1894a, p. 139).

Length 4-5 mm. Vertex, fig. 472A, more angularly produced than in *variata*, with markings similar except for an additional spot next to each eye. Vertex obtusely angled, yellowish or yellowish green, a pair of large round black spots near posterior margin, two large black proximal spots on anterior margin, and a black spot between ocellus and compound eye on each side. Elytra whitish hyaline, often smoky on basal portion. Female seventh sternite, fig. 472B, with posterior margin convexly rounded on either side of a median broad shallow notch. Male plates, fig. 472C, rather short, apexes attenuated and appressed. Aedeagus, fig. 479A, similar to that of *variata*, terminating in two finger-like processes, each recurved beneath for one-third the length of shaft; apical portion armed with teeth. Styles as in fig. 479C.

Rather common in moist areas, especially in woodland marshy habitats, *lepida* occurs in the eastern part of the United States and in the Middle West.

Illinois Records.—Males and females, taken May 7 to August 25, are from Algonquin, Champaign, Dolson, Dubois, East Cape Girardeau, Havana, Karnak, Paxton, Urbana, Vienna, Volo, Wauconda, and Zion.

#### 6. *Macrosteles variata* (Fallen)

*Cicada variata* Fallen (1806, p. 34).

*Jassus fumatus* Herrick-Schaeffer (1838, fasc. 153, p. 5).

Length 5-6 mm. Yellowish or yellowish green, vertex, fig. 473A, with two large black spots on anterior margin and two large black spots near posterior margin; vertex bluntly and angularly produced. Elytra whitish hyaline, often smoky. Female seventh sternite, fig. 473B, truncate, with a V-shaped notch at center. Male plates, fig. 473C, with long attenuate apices. Aede-

gus, fig. 482A, terminating in two finger-like processes that are about one-half the length of aedeagus shaft and recurved under shaft. Style as in fig. 482C.

A common species on *Impatiens* in moist woodland areas, *variata* is widely distributed in the East and Middle West, and to Colorado and New Mexico.

**Illinois Records.**—Many males and females, taken May 18 to October 16, are from Algonquin, Alton, Antioch, Apple River Canyon State Park, Beach, Charleston, Chemung, Chicago, Dixon, Dolson, Dubois, Elizabeth, Elizabethtown, Elmira, Fern Cliff, Fox Lake, Freeport, Grinnell, Homer, Karnak, Meredosia, Metropolis, Monticello, Mounds, Oak Lawn, Oquawka, Paxton, St. Joseph, Savanna, Shawneetown, Temple Hill, Urbana, Volo, Wauconda, White Heath, Wilmington, and Zion.

### Subfamily JASSINAE

This group is characterized by a vertex that is comparatively narrow anteriorly between the eyes but distinctly broadened posteriorly behind the eyes. The vertex is raised between the eyes like a broad keel. The forewing is broad and broadly rounded at apex. Frons long and nearly parallel sided.

Two North American genera belong to this subfamily.

### KEY TO GENERA

- Face narrow, sides inflated below eyes, and with frons, fig. 13, about three times as long as wide; ocelli not visible between eyes; end of abdomen exposed beyond elytra, fig. 485 ..... **104. Tinobregmus**
- Face broad, sides narrowed below eye, and with frons, fig. 14, about twice as long as wide; ocelli visible between eyes; elytra covering abdomen. .... **103. Jassus**

### 103. *JASSUS* Fabricius

*Jassus* Fabricius (1803, p. 85).

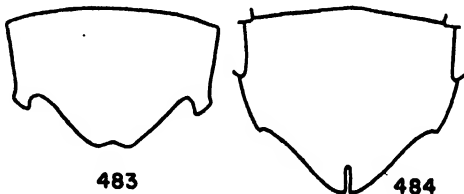
Figs. 14, 24, 486. Head narrower than pronotum, vertex quadrate, broadly curved anteriorly, only slightly produced before anterior margins of eyes; eyes large, not widely separated. Pronotum very short, emarginate posteriorly. Scutellum large, very wide at base. Elytra broad, rather short, apexes broadly rounded.

Four of the five species recorded for the

United States by Lawson (1927) are found in the eastern part of this country, and two of these have been taken in Illinois, while a third species may occur here.

### KEY TO SPECIES

1. Color dark or transversely banded, but elytra without lighter costal margins; aedeagus bent or hooked at tip; female seventh sternite variable. .... **2**



Female seventh sternite

Fig. 483.—*Jassus melanotus*.

Fig. 484.—*Jassus olitorius*.

- Color dark, costal margins pale; female seventh sternite, fig. 483, with shallow apical indentation; apex of lower portion of aedeagus blunt, not bent. .... **1. melanotus**
2. Males dark or usually uniformly colored, females usually with two distinct transverse bands on each elytron; female seventh sternite, fig. 484, with a narrow median incision at produced apex. .... **2. olitorius**
- Unicolorous or with veins darker, each elytron with not more than one transverse band; female seventh sternite with a faint notch at apex. .... **3. borealis**

### 1. *Jassus melanotus* Spangberg

*Jassus melanotus* Spangberg (1878a, p. 19).

Length of male 6.0 mm., female 7.5 mm. Robust; pronotum, scutellum, and elytra dark brown to black, without pale transverse bands in female but with each apex and costal margin pale, often conspicuously yellow. Vertex light greenish yellow, median longitudinal line brown; eyes dark. Face greenish, with sides showing faint fuscous arcs. Venter yellowish, marked with black. Female seventh sternite, fig. 483, with posterior margin bisinuate, forming three lobes, the central one larger, longer than lateral lobes and keeled at center. Male plates long and narrow. Ventral portion of aedeagus with apical portion bent anteriorly and with an apical spine.

This species has been collected in low

marshy areas in the willow-sedge habitat. It occurs in the eastern and middle western states. The food plant is not known.

**Illinois Records.**—Males and females, taken June 27 to August 28, are from Alto Pass, Apple River Canyon State Park, Che-mung, Fountain Bluff, Golconda, Grand Tower, Jonesboro, Karnak, Shawneetown, Vienna, Warren, White Pines Forest State Park, and Wolf Lake.

## 2. *Jassus olitorius* Say

*Jassus olitorius* Say (1831, p. 310).

*Jassus subbifasciatus* Say (1831, p. 310).

*Jassus fuscipennis* Spangberg (1878a, p. 20).

Fig. 486. Length 6.0–7.5 mm. Female vertex dull yellow, with brown ocelli and markings; pronotum light brown, a pale median stripe bordered with a dark stripe on either side; scutellum with the basal angles and two spots on disc black; elytra brown, nervures black, interrupted twice by light transverse bands. Male with pronotum, scutellum, and elytra darker than in female, without transverse bands on elytra. Vertex obtusely rounded, about as long as basal width. Female seventh sternite, fig. 484, twice as long as preceding, strongly produced and keeled at middle. Male plates long and narrow. Lower portion of aedeagus blunt at apex, with an apical and a ventrocaudal spine.

Common on oak, sassafras, and similar shrubs, *olitorius* occurs in the East and Middle West, and southwest to Arizona.

**Illinois Records.**—Many males and females, taken June 21 to October 1, are from Aldridge, Alto Pass, Apple River Canyon State Park, Ashley, Byron, Carbondale, Charleston, Dixon Springs, Dolson, Dongola, Dubois, Elizabethtown, Fountain Bluff, Golconda, Grand Tower, Herod, Jonesboro, Kampsville, Kankakee, Karnak, La Rue, Lawrenceville, Makanda, Marshall, Metropolis, Normal, Oakwood, Olive Branch, Onarga, Pekin, Pulaski, Quincy, River Forest, Rock Island, St. Joseph, Shawneetown, Sugar Grove, Sumner, Temple Hill, Urbana, Vienna, Warren, Watson, White Heath, and Wolf Lake.

## 3. *Jassus borealis* Spangberg

*Jassus borealis* Spangberg (1879, p. 24).

Length 5.5–8.0 mm. Rusty brown to dark brown, vertex usually yellow, with two

darker spots posterior to middle. Basal angles of scutellum sometimes black. Elytra usually unicolorous, sometimes with paler areas on each clavus and across apexes of anteapical cells; apexes of elytra sometimes tinted with fuscous. Female seventh sternite with distinct lateral angles between which the posterior margin is rather strongly and broadly produced with a faint notch at apex. Male plates long, with rounded apexes. Aedeagus similar to that of *olitorius* but ventral process slightly more enlarged at apex.

This species is known only from South Carolina, Georgia, and Florida.

## 104. *TINOBREGMUS* Van Duzee

*Tinobregmus* Van Duzee (1894b, p. 213).

Figs. 13, 485. Head narrow, short, conical, vertex narrow between eyes, widened anteriorly, expanded behind the eyes; ocelli on vertex near apex; eyes large. Pronotum short, wider than head. Elytra short, extending to middle of abdomen, each with five apical areoles, the outer one much larger. Posterior wings rudimentary. The very small scutellum and elongated face distinguish this from most other genera of Nearctic Cicadellidae.

Lawson (1932a) records four species and one variety of this genus for the United States; only one of these is known to occur in Illinois.

### 1. *Tinobregmus viridescens* DeLong

*Tinobregmus viridescens* DeLong (1916, p. 92).

Fig. 485. Length of male 4.0 mm., female 6.5 mm. Elytra yellowish green; a broad band at each apex, and irregular longitudinal lines running forward from the apex black. Male vertex black; sutures and a triangular area between vertex and eye and the margin of the occiput pale; pronotum greenish yellow. Elytra of male and female similarly marked. Female seventh sternite with a slightly sinuate posterior margin. Male valve and almost all of plates concealed in concavity of last sternite. Pygofers large, curving over the plates.

This species occurs on rank herbaceous growth, especially in open woodland in the middle western and eastern states.

**Illinois Records.**—ASHLEY: July 6, 1889, Marten, 1 ♂. DUBOIS: June 22, 1905,

1 ♀; sweeping from grass, July 2, 1909, 2 ♂, 1 ♀; Aug. 9, 1917, 1 ♂, 6 ♀; Aug. 18, 1917, 3 ♂. METROPOLIS: Aug. 19, 1891, Shiga, 1 ♀. ROSICLARE: July 5, 1935, Frison & Mohr,

Oman (1931) and Knull (1942) have recorded 21 species and several subspecies of *Neocoelidia* for the United States, all of which are western or southwestern in dis-

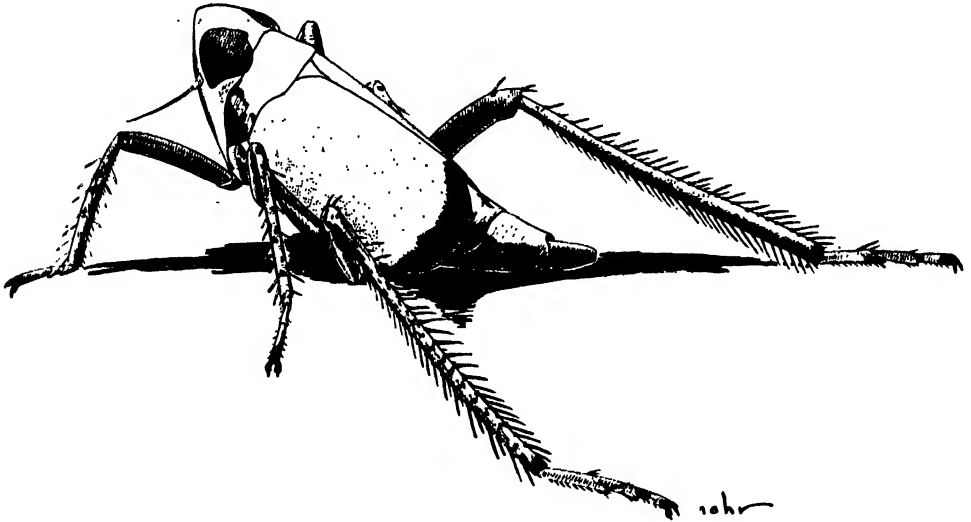


Fig. 485.—*Tinobregmus viridescens*.

1 ♀. SHAWNEETOWN: June 23, 1936, DeLong & Ross, 1 ♂; June 27, 1936, DeLong & Mohr, 2 ♂. VIENNA: June 14, 1934, DeLong & Ross, 1 nymph; July 29, 1934, DeLong & Ross, 2 ♂, 7 ♀.

#### Subfamily NEOCOELIDIINAE

This group contains two Nearctic genera characterized by a raised vertex above and in front of the eyes. They are similar to the Jassinae in this feature, but the frons is expanded dorsad and is not as long and not as nearly parallel as in the Jassinae.

#### KEY TO GENERA

Clypeus with a distinct tubercle.....106. *Paracoelidia*  
Clypeus not tuberculate.....105. *Neocoelidia*

#### 105. *NEOCOELIDIA* Gillette & Baker

*Neocoelidia* Gillette & Baker (1895, p. 103).

Head narrower than pronotum, short, obtusely conical. Frons broad, almost parallel, antennae long. Pronotum short and broad, anterior and posterior margins nearly parallel. Scutellum large. Elytra variable in length, first sector branched once on the apical two-thirds with four apical cells.

tribution. One species, *tumidifrons*, has extended its range into the eastern states.

#### 1. *Neocoelidia tumidifrons* Gillette & Baker

*Neocoelidia tumidifrons* Gillette & Baker (1895, p. 104).

Fig. 487. Length 4 mm. Pale yellow or pale greenish, robust, usually with a black spot in each basal angle of scutellum. Vertex and face often washed with orange. Vertex curved to front, one-half longer at middle than next to eyes. Pronotum three times as broad as long. Elytra broad and rather short, reaching just to tip of abdomen. Female seventh sternite with posterior margin broadly excavated and with a short median tooth; lateral angles slightly rounded. Male valve broadly triangular. Plates more than one-half longer than valve, gradually tapered from bases to pointed apices, exceeded by pygofers at apexes. Pygofers visible at the sides of plates to bases.

Common in moist wooded areas, especially where herbaceous growth is abundant, this species has been found in the eastern states and west to Texas and Colorado.

Illinois Records.—Males and females, taken May 9 to August 23, are from Alto Pass, Dongola, Dubois, Evergreen Park,

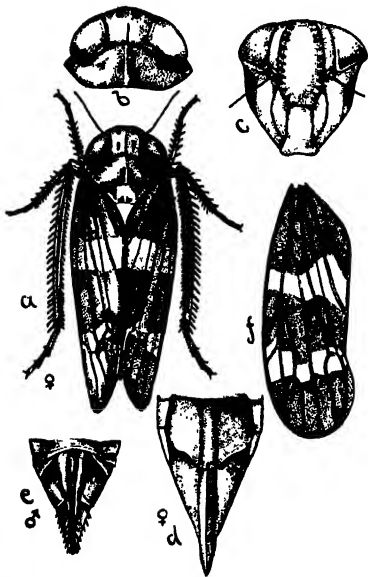


Fig. 486.—*Jassus olitorius*: a, adult; b, head and pronotum; c, face; d, female genitalia; e, male genitalia; f, elytron. (From Osborn.)

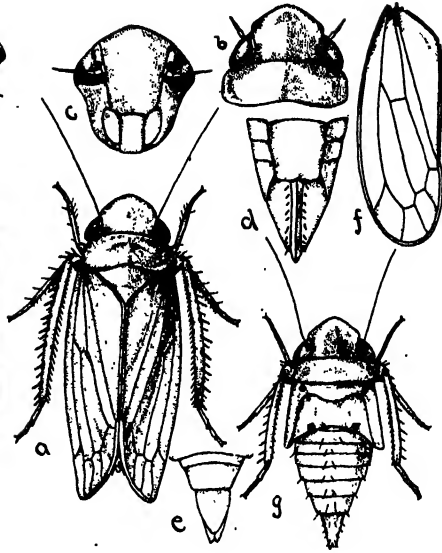


Fig. 487.—*Neocoelidia tumidifrons*: a, adult; b, head and pronotum; c, face; d, female genitalia; e, male genitalia; f, elytron; g, nymph.

Jonesboro, Karnak, Oak Lawn, Oakwood, Olive Branch, Pankeyville, Shawneetown, Vienna, and Wauconda.

### 106. *PARACOELIDIA* Baker

*Paracoelidia* Baker (1898f, p. 292).

Very similar to *Neocoelidia*, but with a decided tubercle on clypeus. Wings always long and narrow.

Only one of the three Nearctic species may occur in Illinois. The others are known only from Arizona.

#### 1. *Paracoelidia tuberculata* Baker

*Paracoelidia tuberculata* Baker (1898f, p. 292).

Length 5 mm. Slender, elongate, similar in general appearance to the western species of *Neocoelidia*, but with a tubercle on the clypeus. Vertex produced, subangulate. Color yellowish, elytra subhyaline, a smoky stripe along the inner margins, and apexes smoky. Female seventh sternite truncate. Male valve long, angled, tapering. Male plates short, apexes obtuse.

Although common on pine in various areas of the eastern and southern United States, *tuberculata* has not been taken in Illinois. Eventually it may be found here.

### Subfamily BALCLUTHINAE

The two anteapical cells of the forewing and three apical cells of the hind wing will easily separate the members of this group from other subfamilies, except some long-winged forms of normally short-winged Athysaninae.

Representatives of two genera belonging to this group occur in Illinois.

#### KEY TO GENERA

- Head narrower than pronotum, somewhat angularly produced, fig. 28. .... 107. *Balclutha*  
 Head wider than pronotum, vertex not produced, broadly rounded, fig. 25. .... 108. *Nesosteles*

### 107. *BALCLUTHA* Kirkaldy

*Gnathodus* Fieber (1866, p. 505). Name preoccupied.

*Balclutha* Kirkaldy (1900, p. 243). New name. *Eugnathodus* Baker (1903, p. 1).

Fig. 28. Head narrower than pronotum, vertex broadly rounded to bluntly and angularly produced. Each elytron with inner sector not forked, forming two anteapical cells. Aedeagus usually enlarged at base but not forming a dorsally directed process at anterior end.

Davidson & DeLong (1935) recorded

six species and two varieties for the United States, of which three species and the two varieties occur in Illinois. The other species are western.

#### KEY TO SPECIES

1. Vertex broadly rounded; aedeagus, fig. 489A, short, apex curved caudally and dorsally but not anteriorly.....1. *abdominalis*

Vertex bluntly angled; aedeagus longer, directed anteriorly at apex and sometimes extending into preceding segment.....2

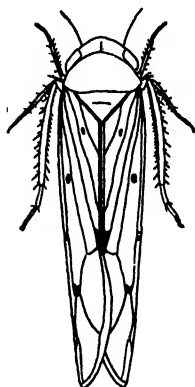


Fig. 488.—*Balclutha punctata*. (From Osborn.)

2. Aedeagus, fig. 489B, abruptly narrowed near base to a long and slender portion, which extends to posterior margin of preceding segment.....3
- Aedeagus, fig. 489C, shorter, basal portion more gradually narrowed to apical portion, which extends anteriorly only about half way to posterior margin of preceding segment; dorsum marked with brown.....2. *punctata*
3. Color yellowish, sometimes washed with pale green.....3. *impicta*  
Color usually dark green, or if pale then marked with black or brown.....4
4. Color dark green, veins conspicuously green or rugose.....4. *impicta* var. *osborni*  
Color yellowish or greenish, mottled with dark green or black.....5. *impicta* var. *maculata*

#### 1. *Balclutha abdominalis* (Van Duzee)

*Gnathodus abdominalis* Van Duzee (1892b, p. 113).

Length 3 mm. Dull yellow, ocelli dark; vertex bluntly rounded, a little more than twice as wide as median length, produced more than one-half its length before anterior margins of the eyes. Pronotum with prominent lateral angles. Aedeagus in lateral view, fig. 489A, with a basal enlargement extending dorsally; apical portion gradually tapering to a dorsally directed tip. Styles with

thick blunt apical processes. Connective thick at base, with a rather narrow incision. Apex enlarged and slightly indented at middle.

This is a common transcontinental species which, in Illinois, occurs on herbaceous growth.

**Illinois Records.**—Many males and females, taken April 21 to November 15, are from Algonquin, Alton, Alto Pass, Anna, Apple River Canyon State Park, Beach, Brownfield, Cave in Rock, Champaign, Dixon, Dixon Springs, Dolson, Dongola, Effingham, Eichorn, Elizabethtown, Evergreen Park, Farina, Fulton, Geff, Golconda, Grafton, Hanover, Havana, Herod, Ingle-side, Justice, Kampsville, Monticello, Muncie, Newton, Norris City, Oakwood, Oquawka, Oregon, Pike, Port Byron, Princeton, Pulaski, Rock Island, St. Anne, Savanna, Savoy, Shawneetown, Springfield, Starved Rock State Park, Urbana, Vienna, Volo, Wauconda, White Heath, and Zion.

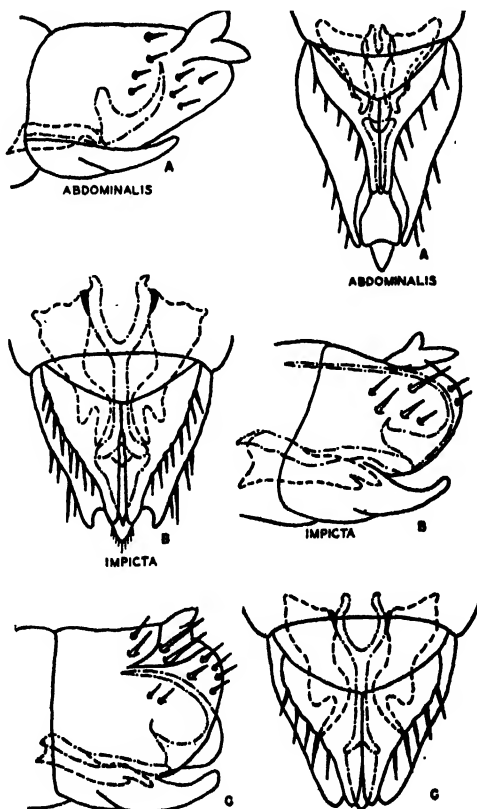


Fig. 489.—*Balclutha*, male genitalia. A—C, ventral and lateral aspects.

## 2. *Balclutha punctata* (Thunberg)

*Cicada punctata* Thunberg (1784, p. 21).  
*Gnathodus confusus* Gillette & Baker (1895, p. 104).  
*Gnathodus occidentalis* Baker (1896a, p. 41).  
*Gnathodus livingstoni* Baker (1896a, p. 42).

Fig. 488. Length 3.5–4.0 mm. Color variable from gray or pale yellow to green and with markings variable or absent. The well-marked specimen with a somewhat reddish broken transverse band across vertex; mottlings on anterior portion of pronotum and median longitudinal line of pronotum, and basal angles and median line on scutellum reddish or brown. Elytra frequently with veins ferruginous or brown; inner portion of each clavus and a broken oblique band extending almost to costa brown; tip of clavus, spot on disc, also spots on posterior portions of antepical cells, and portions of outer and inner apical cells brown. Vertex bluntly angled, almost parallel margined, nearly four times as wide between eyes as median length, produced almost its entire length before anterior margins of the eyes.

Aedeagus in lateral view, fig. 489C, gradually tapering from a broad elongated basal portion to a slender apical portion that is pointed and curves dorsally, then anteriorly, the apex reaching the middle of the last segment or a little farther cephalad. Apex of connective terminating in two rather narrow divergent processes.

A common species in Illinois, *punctata* ranges from the Middle West to British Columbia.

**Illinois Records.**—Many males and females, taken March 26 to November 12, are from Algonquin, Alto Pass, Amboy, Apple River Canyon State Park, Beach, Chemung, Danville, Dubois, Effingham, Fountain Bluff, Herod, Hopedale, Lake Villa, Mahomet, Monticello, Muncie, Oakwood, Ozark, Palos Park, Rock Island, Urbana, Volo, White Heath, and Zion.

## 3. *Balclutha impicta* (Van Duzee)

*Gnathodus impictus* Van Duzee (1892b, p. 113).

Length 3.5 mm. Yellow, tinged with green. Vertex bluntly angled, conspicuously narrower than pronotum, more than three times as wide as median length, produced two-thirds its length before anterior mar-

gins of the eyes. Aedeagus in lateral view, fig. 489B, enlarged at base, apical portion long and narrow, extending dorsally, then directed anteriorly along dorsal wall into preceding abdominal segment. Styles deeply notched at apexes forming long curved inner finger-like processes. Connective widely and deeply notched at base, forming a pair of widely separated curved processes. Apex deeply notched so as to form two rounded divergent tips.

A very common species in Illinois, *impicta* is found in the eastern states and west to Washington.

**Illinois Records.**—Many males and females, taken May 10 to September 20, are from Algonquin, Antioch, Apple River Canyon State Park, Atlas, Beach, Buckley, Buda, Cairo, Cave in Rock, Champaign, Chemung, Danville, Dixon Springs, Dolson, Dongola, Dubois, Eichorn, Elizabeth, Elizabethtown, Farina, Fourth Lake, Grafton, Havana, Herod, Justice, Kampsville, Karnak, La Grange, Lake Villa, Macomb, Monticello, Muncie, New Milford, Newton, Niota, Norris City, Oakwood, Oregon, Palos Park, Pike, Port Byron, Rock Island, Round Lake, St. Anne, Savanna, Seymour, Shawneetown, Springfield, Starved Rock State Park, Temple Hill, Urbana, Ursa, Vienna, Volo, Warsaw, Wauconda, White Heath, White Pines Forest State Park, Wilmington, and Zion.

## 4. *Balclutha impicta* var. *osborni* Van Duzee

*Gnathodus viridis* Osborn (1905b, p. 541).  
 Name preoccupied.

*Balclutha osborni* Van Duzee (1916, p. 75).  
 New name.

Length 3.5–4.0 mm. Size and form of *impicta*, with the same type of genital characters. Color yellowish, tinted with green. Venation dark green, rugose.

This form has been recorded from the eastern states and Canada, and a few specimens have been taken in Illinois.

**Illinois Records.**—APPLE RIVER CANYON STATE PARK: July 11, 1934, DeLong & Ross, 2♂, 2♀. DONGOLA: Aug. 23, 1916, 1♂, 1♀. JONESBORO: State Forest, July 31, 1934, DeLong & Mohr, 1♂. URBANA: July 21, 1889, C. A. Hart, 1♂. VIENNA: June 14, 1934, DeLong & Ross, 2♂. VOLO: July 27, 1934, DeLong & Ross, 1♂.

### 5. *Balclutha impicta* var. *maculata*

Davidson & DeLong

*Balclutha impicta* var. *maculata* Davidson & DeLong (1935, p. 101).

Length 3.5 mm. Coloration same as in well-marked specimens of *punctata*, but with size and genitalia of *impicta*. Markings frequently very heavy, with vertex, pronotum, and entire elytra heavily mottled with brown; often bright green, with heavy markings on posterior portion of pronotum; elytra with scattered spots on each clavus, a large spot at apex, and three or four conspicuous spots on central portion brown. Degree and intensity of spotting vary.

This variety is recorded from the eastern states and west to Wisconsin and Illinois.

**Illinois Records.**—Many males and females, taken April 5 to November 25, are from Algonquin, Apple River Canyon State Park, Carmi, Champaign, Dolson, Dongola, Duncans Mills, Fulton, Golconda, Muncie, Newton, Port Byron, Pulaski, Rock Island, St. Joseph, Springfield, Starved Rock State Park, Urbana, Volo, Warren, White Heath, and White Pines Forest State Park.

## 108. *NESOSTELES* Kirkaldy

*Nesosteles* Kirkaldy (1906, p. 343).

*Agellus* Davidson & DeLong (1933, p. 210).

Fig. 25. Vertex broadly rounded and scarcely produced before the anterior margins of the eyes, anterior and posterior margins almost parallel; head slightly broader than pronotum, lateral posterior angles of pronotum not wider than vertex. General venation as in *Balclutha*, with inner sector of elytron not forked, two anteapical cells being produced. Aedeagus with dorsobasal protruding processes. In *Balclutha* the basal portion is enlarged and may extend dorsally but without finger-like processes.

Davidson & DeLong (1935) record eight species and one variety in the United States, but only one species and the only variety in the genus are known to occur in Illinois.

### 1. *Nesosteles neglecta* (DeLong & Davidson)

*Eugnathodus neglecta* DeLong & Davidson (1933, p. 55).

Length 3.5 mm. Pale to dark brown in color, often with rather conspicuous mark-

ings on vertex, pronotum, and scutellum. Elytra smoky to white. Vertex broadly rounded, almost parallel margined, and about four times as wide as long. Female seventh sternite almost truncate, posterior margin slightly emarginate on either side of a central slightly produced inconspicuous median tooth. Male plates triangular, about half as wide at base as long. Aedeagus in lateral view rather heavy at base, anterior process extending dorsally, arising not far from the point of union with the connective; body of aedeagus extending caudally, tapered, and extending dorsally and slightly posteriorly; terminal portion about twice the length of the anterior process.

This species is common and widely distributed in the United States and is found throughout Illinois.

**Illinois Records.**—Many males and females, taken May 4 to October 11, are from Alton, Apple River Canyon State Park, Beach, Billett, Carman, Collinsville, Evergreen Park, Fox Lake, Fulton, Galena, Hanover, Havana, Herod, Lawrenceville, Monmouth, Monticello, Mount Carmel, Mount Sterling, Muncie, Oakwood, Ogden, Oquawka, Pere Marquette State Park, Pike, Port Byron, Rock Island, Starved Rock State Park, Thomson, Urbana, Vienna, and Zion.

### 2. *Nesosteles neglecta* var. *pallidens* DeLong

*Eugnathodus neglecta* var. *pallida* DeLong & Davidson (1933, p. 56). Name preoccupied. *Nesosteles neglectus* var. *pallidens* DeLong (1944b, p. 272). New name.

Length 3.0–3.5 mm. In form and general appearance similar to typical *neglecta*, but pale green or white in color. Disc of pronotum sometimes slightly darker than adjacent areas, and dorsal portion of abdomen black or dark brown. Genital characters as in typical *neglecta*.

This form was previously recorded from the southern states.

**Illinois Records.**—HEROD: Aug. 4, 1934, DeLong & Mohr, 1 ♂. MONMOUTH: at light, July 2, 1934, DeLong & Ross, 1 ♂.

## Subfamily CICADELLINAE

The insects of this group are small and frail. This characteristic alone will usually



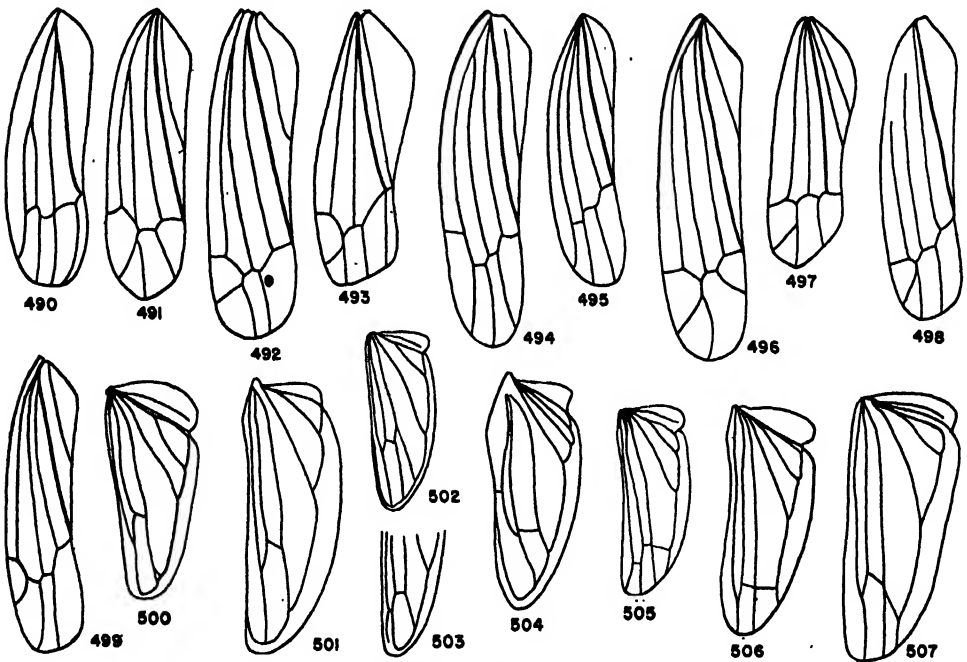
separate them from those of other groups. The absence of crossveins anterior to the apical crossveins is always a good way to characterize these species, and the ocelli are often absent.

As mentioned in the foreword, the size of the group precluded a detailed treatment of the subfamily Cicadellinae in the present project. I have included, however, a key to the Nearctic genera of the subfamily, together with notes on generic diagnosis as an aid to the student in identifying material. As a further aid in this direction, citations are given under several genera to comprehensive taxonomic papers treating them.

KEY TO GENERA

1. Each elytron with definite appendix, with three or four closed apical cells, as in fig. 490.....2

- Each elytron without appendix, number of closed apical cells varied, as in fig. 491.....3
2. Appendix curved and ending at about apical cell; elytra each with four apical and no anteapical cells, fig. 490. Each hind wing with curved anterior veins definitely surrounded by wing membrane.....110. *Alebra*
- Appendix nearly straight, not extending to apical cell; elytra each with three or four apical cells, anteapicals sometimes present, fig. 493. Each hind wing with the curved anterior apical vein marginal.....109. *Protalebra*
3. Veins of hind wings ending in a marginal vein, apical cells closed, fig. 500.....4
- Veins of hind wings extending to margin, one or more apical cells not closed, fig. 505.....10
4. Anterior apical vein of each hind wing not coalescing with costal margin, continuous with first sector in bounding the outermost closed apical cell, fig. 500... 115. *Empoasca*



Elytra of Cicadellinae

- Fig. 490.—*Alebra albostriella*.  
 Fig. 491.—*Empoasca obtusa*.  
 Fig. 492.—*Alconeura rotundata*.  
 Fig. 493.—*Protalebra brasiliensis*.  
 Fig. 494.—*Dikraneura mali*.

- Fig. 495.—*Forcipata loca*.  
 Fig. 496.—*Typhlocyba* sp.  
 Fig. 497.—*Dikraneuroidea beameri*.  
 Fig. 498.—*Idona minuenda*.  
 Fig. 499.—*Erythroneura obliqua*.

Hind wings of Cicadellinae

- Fig. 500.—*Empoasca obtusa*.  
 Fig. 501.—*Idona minuenda*.  
 Fig. 502.—*Forcipata loca*.  
 Fig. 503.—*Joruma* sp.

- Fig. 504.—*Dikraneuroidea beameri*.  
 Fig. 505.—*Cicadella flavoscuta*.  
 Fig. 506.—*Typhlocyba querci*.  
 Fig. 507.—*Erythroneura obliqua*.

Anterior apical vein of each hind wing directed toward, often joining, costal margin, not continuous with first sector and not forming part of boundary of outermost distally closed apical cell, fig. 502.....5

5. Each hind wing with two closed apical cells, fig. 502.....6

Each hind wing with one closed apical cell, fig. 501.....8

6. Second apical cell of each elytron distinctly pedunculate at base, fig. 492.....

.....113. *Alconeura*  
Second apical cell of each elytron not pedunculate at base, fig. 494.....7

7. Elytra each with first crossvein present, fig. 494; male plates, fig. 512*A*, flat, triangular; female seventh sternite, fig. 512*C*, rounded.....112. *Dikraneura*

Elytra each with first crossvein wanting; second, third, and fourth crossveins spaced more distant from each other than above, fig. 495; male plates, figs. 514*A*, 514*B*, cylindrical, narrow, greatly separated at middle; female seventh sternite, fig. 514*C*, with a large median strongly produced lobe.....

- .....114. *Forcipata*  
8. Elytral crossveins usually not meeting; third apical cell pedunculate, fig. 498.....

.....116. *Idona*  
Elytral crossveins usually in line; second apical cell pedunculate, fig. 497; hind wing as in fig. 504.....

- .....111. *Dikraneuroidea*  
9. Hind wings with at least one closed and one open apical cell, fig. 503.....

.....117. *Joruma*  
Hind wings with no closed apical cells, fig. 505.....10

10. Hind wing with four veins extending to margin of wing, forming three open apical cells, fig. 505.....118. *Cicadella*

Hind wing with three veins extending to margin of wing, forming two open apical cells, fig. 506.....11

11. Elytra with fourth apical vein of each curving to rounded margin; second apical cell triangular, usually stalked, fig. 496.....

.....119. *Typhlocyba*  
Elytra with fourth apical vein of each more nearly paralleling margin, second apical cell quadrate, not stalked, fig. 499.....12

12. Scutellum elevated at apex, fig. 513*E*.....

.....120. *Hymetta*  
Scutellum flat, not elevated at apex.....

## 109. *PROTALEBRA* Baker

*Protalesbra* Baker (1899, p. 402).

Fig. 493. This genus is characterized by having a definite appendix on each elytron, appendix not extending around the apex; the elytron has four apical and no ante-apical cells. The species of this genus are tropical or subtropical, and only two are recorded for the United States. One of

these, *brasiliensis* Baker (1899, p. 405), occurs in the United States in Florida and Texas only.

## 110. *ALEBRA* Fieber

*Alebra* Fieber (1872, p. 14).

Fig. 490. This genus has a definite appendix extending around the apex of each elytron. There are four apical and no ante-apical cells in the elytron. The vertex is usually rather broadly rounded and scarcely or only slightly produced anteriorly.

Insofar as known the members of this genus feed upon trees and shrubs. About a dozen species and varieties have been recorded for the Nearctic region. The common species of the genus in Illinois is *albo-striella* (Fallen) (1826, p. 54).

## 111. *DIKRANEUROIDEA* Lawson

*Dikraneuroidea* Lawson (1929, p. 307).

Figs. 497, 504. The only member of this genus resembles certain species of *Dikraneura*, but it has only one closed apical cell in the hind wing. It is further distinguished from closely related genera by having the crossveins almost in a straight line. The only known species of this genus, *beameri* Lawson (1929, p. 307), occurs in Texas.

## 112. *DIKRANEURA* Hardy

*Dikraneura* Hardy (1850, p. 423).

Fig. 494. The genus *Dikraneura* belongs to the group of genera that have two closed apical cells in the hind wing. Each elytron has the first crossvein present, and one or both of the first and fourth crossveins are but little basad of the second and third; the latter two are usually but little basad of each other. The vertex is usually well produced and bluntly, sometimes pointedly, angled.

About 60 Nearctic species have been described, and several occur in Illinois. A common grassland and pasture species is *mali* (Provancher) (1890, p. 298). The vertex, female seventh sternite, and male genitalia are shown in fig. 512.

## 113. *ALCONEURA* Ball & DeLong

*Alconeura* Ball & DeLong (1925, p. 334).

Fig. 492. This genus is closely related to *Dikraneura* and contains species that are

small, robust, and usually highly ornamented. Each hind wing has two closed apical cells. Each elytron has four distinct apical cells; the second cell is always triangular and pedunculate. Due to the union of the second and third nervures for some distance at the base, the first cell is distinct but irregular in shape.

Griffith (1936) records 20 Nearctic species of *Alconeura*, and nearly all are found in the West and Southwest. One species, *rotundata* Ball & DeLong (1925, p. 335), has been taken in the states just west of Illinois, and may be collected at some time in this state.

#### 114. *FORCIPATA* DeLong & Caldwell

*Forcipata* DeLong & Caldwell (1942, p. 49; see also 1936, p. 70).

Figs. 495, 502. The species of this genus have bluntly angled heads and resemble species of *Dikraneura* in form and general appearance. They are usually yellow, tinged with orange, and have genital structures that differ from those of allied genera. The male plates are cylindrical, strongly curved outwardly at base so that they are widely separated at middle. The female seventh sternite bears a large strongly produced median lobe that differs in shape among the species, but always occupies the median half or more of the posterior margin. Each elytron lacks the first crossvein, and the second, third, and fourth crossveins are more widely separated than in the *Dikraneura* elytron.

Ten species of *Forcipata* are known for the United States, of which *loca* DeLong & Caldwell (1936, p. 71; 1942, p. 49) is the most widely distributed eastern one. It is common in Illinois on small grasses in pastures and open woodland.

#### 115. *EMPOASCA* Walsh

*Empoasca* Walsh (1862, p. 149).

Figs. 491, 500, 508. For the most part this genus contains small delicate greenish species of leafhoppers. The members of this genus can most easily be distinguished from their close generic relatives by the absence of an appendix on the elytron and by the presence of one apical cell in the hind wing, which is closed by a submarginal vein. As in other related genera there are

no anteapical cells present in either pair of wings.

*Empoasca* contains nearly 200 described Nearctic species, and several of them are of economic importance. Two common species in Illinois are *maligna* (Walsh) (1864,

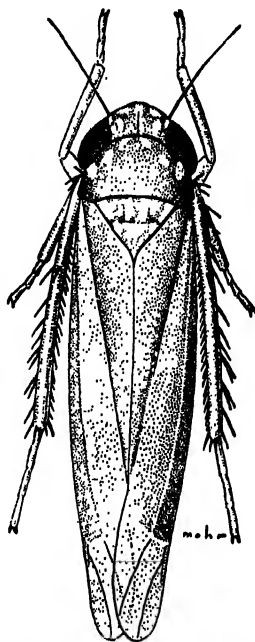


Fig. 508.—*Empoasca fabae*.

p. 317), fig. 510, occurring commonly on apple, and *fabae* (Harris) (1841, p. 186), fig. 511, which occurs on nearly all leguminous plants. The second species is especially a pest of clover, alfalfa, beans, and potatoes, and is frequently abundant on apple. Most of the species of this genus are so closely related that they can be distinguished only by characters of the male genitalia.

#### 116. *IDONA* DeLong

*Idona* DeLong (1931, p. 50).

Figs. 498, 501. The genus may be characterized as having a strongly produced and bluntly pointed vertex. Each hind wing has only one closed apical cell. The crossveins of each elytron are not arranged in a straight line, and the third apical cell is parallel sided. One United States species with two varieties is known. The typical species, *minuenda* (Ball) (1921, p. 23), is greenish in color and resembles some species of *Empoasca*.

117. *JORUMA* McAtee

*Joruma* McAtee (1924, p. 34).

Fig. 503. This genus is characterized by having the hind pair of wings each with one closed and one open apical cell. In contrast to most of the genera of Cicadellinae, this genus has well-developed ocelli. The crossvein that should form the base for the first apical cell is rudimentary.

Two species are known for the United States; at least one of these, *pisca* McAtee (1924, p. 34), may be found in southern Illinois.

118. *CICADELLA* Duméril

*Cicadella* Duméril (1806, pp. 266-7, 334).  
*Eupteryx* Curtis (1833, p. 192).

Fig. 505. In general appearance the members of the genus *Cicadella* resemble species of *Typhlocyba*, to which they are closely related. Each hind wing of *Cicadella* has no wing margin; so the four veins extend to the margin, forming three apical cells. In *Typhlocyba* only two apical cells are formed.

About 10 species of *Cicadella* are known for the United States. *C. flavoscuta* (Gillette) (1898b, p. 749) has been taken in small numbers in Illinois. It lives upon ferns in wooded areas. Several other species probably occur here.

119. *TYPHLOCYBA* Germar

*Typhlocyba* Germar (1833, p. 180).

Figs. 496, 506. The species of the genus *Typhlocyba* are for the most part white, cream, or pale in color but often with bright markings. Most of the species feed upon trees and shrubs. These species have a blunt produced vertex, which is scarcely angled, almost rounded, and each hind wing has two open apical cells. The second apical cell of each elytron is triangular, usually with a basal stalk.

About 80 Nearctic species and varieties of this genus are known. Probably the most common and important species in Illinois is the white apple leafhopper, *pomaria* McAtee (1926, p. 29). It is a common pest of apple in the East and Middle West, and at times becomes very abundant, causing a considerable loss of chlorophyll in the leaves.

120. *HYMETTA* McAtee

*Hymetta* McAtee (1919, p. 121).

Fig. 513E. The chief character that separates this genus from *Erythroneura*, to which it is closely allied, is the thickened scutellum and the elevation of its posterior margin. The venational characters of the wing are very close to those of *Erythroneura*.

Eight species and varieties of *Hymetta* have been described for the United States. A common species on shrubbery in wooded areas is *trifasciata* (Say) (1825, p. 344).

121. *ERYTHRONEURA* Fitch

*Erythroneura* Fitch (1851, p. 62).

Figs. 499, 507, 509. This genus contains several hundred minute species of leafhoppers, many of which are pale, with color spots or stripes, or more generally brightly colored, especially with some shade of red. The vertex is produced, bluntly angled, with the apex often rounded. These leafhoppers belong to the group that has no closed apical cells in the hind wing and has two open or incomplete cells formed by three veins extending to the apical margin. *Erythroneura* differs from *Typhlocyba* and *Hymetta* by having the second apical cell quadrate instead of triangular.

Former workers, particularly McAtee (1920), Robinson (1926), and Beamer (1936b, 1946), have divided the species into various groups upon the basis of wing venation, and the following key to groups is based upon their work and adapted from it.

## KEY TO GROUPS

1. Second sector of each elytron joining with the fourth apical vein at crossveins, forming a definite continuous line. . . . 2  
    Second sector of each elytron staggered at crossveins, not joining with the fourth apical vein. . . . . 3
2. Basal crossvein of fourth apical cell oblique. . . . . *maculata* group  
    Basal crossvein of fourth apical cell square. . . . . *comes* group
3. Basal crossvein of fourth apical cell curved or sloping; vertex and pronotum marked with two stripes that diverge posteriorly. . . . . *obliqua* group  
    Basal crossvein composed of two short veins that are angled with each other; vertex and pronotum usually without divergent stripes. . . . . *vulnerata-kansana* group

### The *obliqua* Group

The species that are allied in this group have a color pattern consisting of oblique reddish lines or a V-shaped mark upon the vertex and pronotum; this pattern may be variously modified in both color and intensity so that a broad dark or reddish stripe may occur on each elytron, forming a rather solid stripe on the middle of the closed elytra. The pygofer hooks of this group are rather short, thick, pointed at the apical ends, each bearing a short process beneath.

The typical coloration of *obliqua* (Say) (1825, p. 342) is yellow, with two red stripes on vertex and pronotum, stripes diverging from apex of vertex. Elytra each with two oblique red stripes, one on each clavus and another on corium close to claval suture. There is also a reddish stripe along costal margin. In one common species, *lawsoniana* Baker (1926, p. 347), the color pattern is such that a broad stripe widens from apex of elytra. This stripe may vary in color from bright red to black. Both of the species mentioned above are commonly found on apple.

### The *vulnerata* Group

The species of this group are all dark colored, with a pale median longitudinal line across vertex, pronotum, and scutellum. The crossveins, and frequently short portions of other veins, are white.

The most common species, *vulnerata* Fitch (1851, pp. 62, 63), is dark greenish, reddish, or brown, with median white line across vertex, pronotum, and scutellum, and a line bordering each eye. The pronotum is marked with white spots. Each of the elytra is marked with white on the clavus and corium. This species is common on grape and other vines.

### The *kansana* Group

This group differs from the *vulnerata* group in color only and can scarcely be considered as a separate group. These species are not dark in color nor do they have the median pale stripe on the vertex, pronotum, and scutellum, but they are variable in color and seem to have no constant character to separate them from that group.

A common species of this group, *kansana* Baker (1925, p. 537), is characterized by

having a dark brown or black scutellum. The vertex varies in color from reddish with pale spots to dusky yellow. The pronotum may vary from yellow with reddish markings anteriorly and brown posteriorly

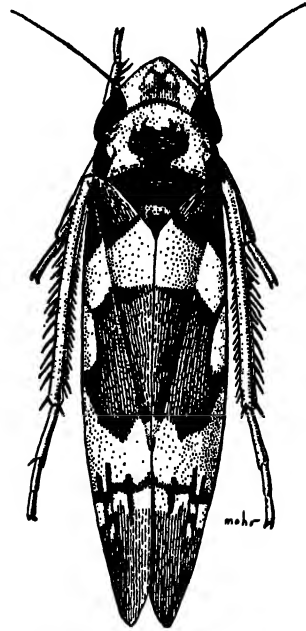


Fig. 509.—*Erythroneura vitis*.

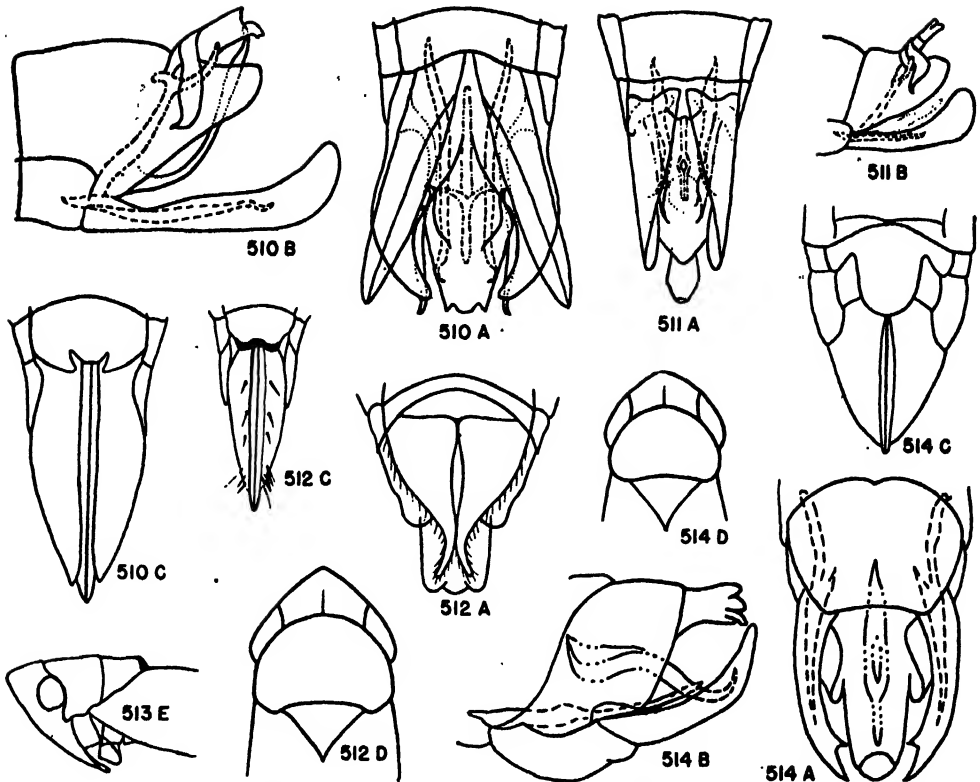
to a dark brown throughout. The elytra are pale, with reddish markings on each clavus, corium, and on crossveins. This species is often common on apple or ornamental plants.

### The *maculata* Group

The species of this group can be separated from those of other groups by a wing character as noted in the key, and in addition the fourth apical cell is always marked by a black spot in basal portion. The pygofer hooks are long and spearlike.

Two color patterns are predominant in this group. The *maculata* type pattern, found in *maculata* (Gillette) (1898b, p. 764), is composed of a yellow or pale background upon which is a rather large number of small red or yellow spots. The other color pattern is either a transverse or oblique band of red or some shade of brown upon a pale background. *E. basilaris* (Say) (1825, p. 344) is a common example of this second group.

*E. maculata* is a common species on wild



Cicadellinae: *A*, ventral aspect of male genitalia; *B*, lateral aspect of male genitalia; *C*, female genitalia; *D*, head and pronotum; *E*, head, thorax, and scutellum, lateral aspect.

Fig. 510.—*Empoasca maligna*.

Fig. 511.—*Empoasca fabae*.

Fig. 512.—*Dikraneura mali*.

Fig. 513.—*Hymettia trifasciata*.

Fig. 514.—*Forcipata loca*.

and cultivated grape, and at times becomes abundant on *Crataegus*. *E. basilaris* is one of the common species on apple and ornamental plants.

### The *comes* Group

This group is one of the largest of the genus, and the species are rather difficult to separate. As noted, this group has the fourth apical cell with a square base; the second apical cell has either a black spot or a smoky area in its apical portion, and the base of the fourth apical is similarly marked. Pygofer hooks of the male genitalia form U-shaped processes, the ventral one of which is always longer.

In color the members of the *comes* group vary greatly, and there is no uniform color pattern that can be used in recognizing the

species of this group. Certain species are very pale, either with no markings, as in the case of *delicata* McAtee (1920, p. 317), or with faint markings, which are not easily recognized. Other species, for example *infusata* Gillette (1898b, p. 764), are almost entirely dark brown. Still others are marked with bands or stripes. *E. trilineata* (Fitch) (1851, p. 63) has transverse bands, and *ziczac* Walsh (1862, p. 149) is marked with some rather broad zigzag longitudinal stripes.

*E. comes* (Say) (1825, p. 343), is common on wild and cultivated grape; *ziczac* is common on certain ornamental vines, especially Boston ivy. It also occurs on wild grape, poison ivy, and Virginia creeper. *E. trilineata* is one of the well known and more distinctly marked grape leafhoppers, and it is also found on several of the ornamental vines.



## LITERATURE CITED

Amyot, Charles Jean Baptiste, and Audinet Serville

1843. *Histoire naturelle des insectes. Hémiptères*. 76+675+6 pp., 12 pls. Paris.

Baker, Carl F.

- 1896a. The North American species of *Gnathodus*. *Can. Ent.* 28(2):35-42.
- 1896b. New Homoptera received from the New Mexico Agricultural Experiment Station. *Psyche* 7(Suppl.):24-6.
- 1897. Some new and little-known Dorydini (Jassinae). *Can. Ent.* 29(6):157-9.
- 1898a. Five new species of *Phlepsius*. *Ent. News* 9(3):65-7.
- 1898b. Four new species of *Phlepsius*. *Can. Ent.* 30(2):30-2.
- 1898c. *Athysanella*, a new genus of jassids. *Psyche* 8:185-9.
- 1898d. Notes on *Chlorotettix*, with some new species. *Can. Ent.* 30(8):219-20.
- 1898e. New Tettigoninae, with notes on others. *Psyche* 8:285-6.
- 1898f. Notes on Jassini, with some new species. *Can. Ent.* 30(11):289-92.
- 1899. On *Alebra* and related genera. *Psyche* 8:401-5.
- 1900a. On some American species of *Macropsis* (Jassidae). *Psyche* 9:55-9.
- 1900b. Four new species of *Platymetopius*. *Can. Ent.* 32(2):49-50.
- 1903. On the *Gnathodus* species of the *abdominalis* group. *Invertebrata Pacifica* 1:1-2.
- 1924. Nomenclatorial notes on the Jassoidea. *Philippine Jour. Sci.* 24(3):367.
- 1925. Nomenclatorial notes on the Jassoidea, IV. *Philippine Jour. Sci.* 27(4):537.
- 1926. Nomenclatorial notes on the Jassoidea, V. *Philippine Jour. Sci.* 30(3):347.

Ball, Elmer D.

- 1899a. Some new species of *Athysanus*. *Ent. News* 10(6):172-4.
- 1899b. Some new species of *Deltocephalus*. *Can. Ent.* 31(7):188-92.
- 1900a. Notes on the Acocephalina (Homoptera-Jassidae). *Iowa Acad. Sci. Proc.* 7:64-72. 1 pl.
- 1900b. Some new Jassidae from the Southwest. *Can. Ent.* 32(7):200-5.
- 1900c. Additions to the western jassid fauna. *Can. Ent.* 32(11):337-47.
- 1901. A review of the Tettigonidae of North America north of Mexico. *Iowa Acad. Sci. Proc.* 8:35-76. 7 pls.
- 1902a. West coast and other Jassidae (Homoptera). *Can. Ent.* 34(1):12-22.
- 1902b. Some new Bythoscopidae from British Columbia and the Southwest. *Can. Ent.* 34(12):303-13.
- 1903. Some new North American Homoptera. *Can. Ent.* 35(8):227-32.
- 1905. New species of *Phlepsius* and related genera. *Can. Ent.* 37(6):209-12.
- 1907. The genus *Eutettix*. *Davenport Acad. Sci. Proc.* 12:27-94. 4 pls.
- 1909a. Some new North American Jassidae. *Can. Ent.* 41(3):77-84.
- 1909b. Several new western jassids. *Ent. News* 20(4):163-8.
- 1911. Additions to the jassid fauna of North America (Homoptera). *Can. Ent.* 43(6):197-204.
- 1915. New genera and species of Acocephalinae. *Biol. Soc. Wash. Proc.* 28:165-8.
- 1918. The phlepsids of Mexico and Central America. *Ent. Soc. Am. Ann.* 11(4):381-9. 2 pls.
- 1920. A review of the species of the genus *Gypona* occurring in North America north of Mexico (Homoptera). *Ent. Soc. Am. Ann.* 13(1):83-100.
- 1921. The smallest known leaf hopper. *Biol. Soc. Wash. Proc.* 34:23-4.
- 1927. The genus *Draeculacephala* and its allies in North America. *Fla. Ent.* 11:33-40.
- 1928. A supplemental review of the genus *Ophiola* Edw. (*Conosanus* O. & B.) in North America (Homoptera-Cicadellidae). *Brooklyn Ent. Soc. Bul.* 33:185-90.
- 1929. A supplemental revision of the genus *Athysanus* in North America (Homoptera: Cicadellidae). *Am. Ent. Soc. Trans.* 55:1-81.
- 1931a. Some new genera and species of leafhoppers related to *Mesamia* Ball. *Brooklyn Ent. Soc. Bul.* 26:91-5.
- 1931b. Some new genera and species of leafhoppers related to *Eutettix* Van Duzee (Rhynchota, Homoptera). *Fla. Ent.* 15:1-6.
- 1931c. Some new North American genera and species in the group formerly called *Platymetopius* (Rhynchota, Homoptera). *Can. Ent.* 63:216-22; 224-8.
- 1932. New genera and species of leafhoppers related to *Scaphoideus*. *Washington Acad. Sci. Jour.* 22:9-19.
- 1936. Some new genera of leafhoppers related to *Thamnotettix*. *Brooklyn Ent. Soc. Bul.* 31:57-60.



**Ball, Elmer D., and Raymond H. Beamer**

1940. A revision of the genus *Athysanella* and some related genera (Homoptera, Cicadellidae). Kans. Univ. Sci. Bul. 26:5-82. 12 pls.

**Ball, Elmer D., and W. E. China**

1933. Notes on Walker's types of North American leafhoppers of the genus *Draeculacephala*, together with a new species. Kans. Ent. Soc. Jour. 6:1-4. 1 pl.

**Ball, Elmer D., and Dwight M. DeLong**

1925. The genus *Dikraneura* and its allies in North America. Ent. Soc. Am. Ann. 18(3): 324-37. 3 pls.

**Ball, Elmer D., and Frank H. Parker**

1946. Some new North American *Idiocerus*. Kans. Ent. Soc. Jour. 19(3):73-82.

**Ball, Elmer D., and J. A. Reeves**

1927. Further studies on the genus *Gypona* and its allies (Rhynchota, Homoptera). Ent. Soc. Am. Ann. 20(4):488-500. 2 pls.

**Beamer, Raymond H.**

- 1936a. The genus *Dicyphonia*. Kans. Ent. Soc. Jour. 9(2):66-71. 1 pl.  
1936b. Species of *Erythroneura* of the *comes* group. Kans. Univ. Sci. Bul. 24(14):261-307. 6 pls.  
1937. A review of the genus *Osbornellus* in the United States and Canada (Homoptera; Cicadellidae). Kans. Ent. Soc. Jour. 10:89-108. 4 pls.  
1942. Four new species of *Mesamia* (Homoptera, Cicadellidae). Can. Ent. 74(3):44-5.  
1945. A new species of *Dorydiella* from Kansas. Kans. Ent. Soc. Jour. 18(1):48.  
1946. The *Erythroneura* of the *vulnerata* group. Kans. Ent. Soc. Jour. 19(1):15-22. 1 pl.

**Beamer, Raymond H., and Paul B. Lawson**

1938. The genus *Acinopterus* (Homoptera-Cicadellidae). Ent. Soc. Am. Ann. 31(4):476-88. 3 pls.

**Beamer, Raymond H., and L. D. Tuthill**

1934. Some new species and a new genus of Deltocephaloid leafhoppers (Homoptera-Cicadellidae). Kans. Ent. Soc. Jour. 7:1-24. 2 pls.

**Black, L. M., and Paul W. Oman**

1947. Parthenogenesis in a leafhopper, *Agallia quadripunctata* (Provancher) (Homoptera: Cicadellidae). Ent. Soc. Wash. Proc. 49(1):19-20.

**Boheman, Carl H.**

1847. Nya Svenska Homoptera. Handlingar Kongliga Vetenskaps-Akademiens 1847:23-67. Stockholm.

**Brown, William F.**

1933. The genus *Chlorotettix* in America north of Mexico (Homoptera, Cicadellidae). Kans. Univ. Bul. 34(5):235-55. 3 pls.

**Breaker, Edward P.**

1932. A review of the Nearctic species of *Macropsis* (Homoptera, Cicadellidae). Ent. Soc. Am. Ann. 25(4):787-844. 4 pls., 3 figs.

**Brullé, Auguste**

1832. Expédition Scientifique de Morée 3(2):1-29, 64-395. 22 pls. Paris.

**Burmeister, Hermann**

1838. Genera quaedam insectorum iconibus illustravit et descripsit. 8+80+28 pp., 40 pls. Berlin.

**China, W. E.**

1927. Preliminary remarks on Melichar's "Monographie der Cicadellinen" (Hemiptera, Jassoidea). Ann. and Mag. Nat. Hist. (ser. 9) 20:281-3. London.

**Crumb, S. E.**

1915. Some new species of Jassoidea. Ent. Soc. Am. Ann. 8(2):189-97. 1 pl.

**Curtis, John**

1833. Characters of some undescribed genera and species indicated in the guide to an arrangement of British insects. Ent. Mag. 1(19):186-99. London.  
1837. Brit. Ent. 14:pls. 626-73. London.

## Davidson, Ralph H., and Dwight M. DeLong

1933. The genus *Agellus* gen. nov. (Homoptera-Cicadellidae). Ohio Jour. Sci. 33:210.  
 1935. A review of the North American species of *Balclutha* and *Agellus* (Homoptera-Cicadellidae). Ent. Soc. Wash. Proc. 37:97-112.  
 1943. Descriptions of the neotype of *Draeculacephala mollipes* (Say) and a new species previously confused with it. Ohio Jour. Sci. 43(4):193-4. 1 fig.

## DeLong, Dwight M.

1916. The leafhoppers or Jassoidea of Tennessee. Tenn. State Bd. Ent. Bul. 17:1-113.  
 1918a. A new species of Cicadellidae from Wisconsin. Ohio Jour. Sci. 18(6):228.  
 1918b. Additional records of Tennessee Cicadellidae. Ohio Jour. Sci. 18(7):233-42. 4 figs.  
 1919. A synopsis of the genus *Chlorotettix*. Ohio State Univ. Bul. 23(15):1-29. 2 pls.  
 1923. Family Cicadellidae in The Hemiptera or sucking insects of Connecticut. Conn. State Geol. and Nat. Hist. Surv. Bul. 34:56-163. 2 pls., 11 figs.  
 1926a. A monographic study of the North American species of the genus *Deltocephalus*. Ohio State Univ. Studies 2(13):10+129 pp., 30 pls.  
 1926b. Three new species of Cicadellidae previously confused with related species (Homoptera). Am. Ent. Soc. Trans. 52(888):89-102. 1 pl.  
 1931. A revision of the American species of *Empoasca* known to occur north of Mexico. U. S. Dept. Ag. Tech. Bul. 231:1-59. 11 figs.  
 1935a. Some new species of deltocephaloid leafhoppers (Homoptera, Cicadellidae). Ent. Soc. Am. Ann. 28(1):154-9. 1 pl.  
 1935b. A new genus and five new species of leafhoppers related to *Thamnotettix* (Homoptera: Cicadellidae). Ent. News 46:180-3.  
 1936a. Some new genera of leafhoppers related to *Thamnotettix*. Ohio Jour. Sci. 36:217-9.  
 1936b. The genus *Elymana* in North America (Homoptera, Cicadellidae). Ent. Soc. Am. Ann. 29(4):636-9. 1 pl.  
 1937a. Some new deltocephaloid leafhoppers (Homoptera-Cicadellidae) from Illinois. Pan-Pacific Ent. 13:32-3.  
 1937b. The genus *Chlorotettix* (Homoptera-Cicadellidae): some notes on synonymy. Pan-Pacific Ent. 13:34-5.  
 1937c. Six new species of *Graminella* and *Chlorotettix* (Homoptera, Cicadellidae) from the eastern United States. Ent. News 48:50-4.  
 1937d. The genera *Cyperana* and *Paluda* (Homoptera-Cicadellidae). Am. Midland Nat. 18(2):225-36. 2 pls.  
 1938a. Biological studies of the leafhopper *Empoasca fabae*. U. S. Dept. Ag. Tech. Bul. 618. 60 pp.  
 1938b. Some new species of *Texanonus* and *Phlepsius* from the United States. Ohio Jour. Sci. 38(1):41-4.  
 1938c. A new genus and four new species of Cicadellidae (Homoptera) from the United States. Ohio Jour. Sci. 38(4):217-8.  
 1938d. Some new species of *Parabolocratus* (Homoptera, Cicadellidae). Ohio Jour. Sci. 38(6):301-3.  
 1939a. A review of the genus *Scaphoideus*. Ent. Soc. Wash. Proc. 41(2):33-45.  
 1939b. The *Texanonus* (Homoptera, Cicadellidae) species of the *majestus* group with the description of four new species. Ohio Jour. Sci. 39(4):235-8.  
 1941. The red-banded *Osbornellus* species of the *auronitens* group occurring in the United States. Ent. Soc. Am. Ann. 34(1):179-80. 1 fig.  
 1942. A monographic study of the North American species of the subfamily Gyponinae. 14+187 pp., 35 pls. Columbus, Ohio.  
 1943. The Mexican leafhoppers of the genera *Cloanthanus* and *Scaphytopius* (Homoptera-Cicadellidae). Lloydia 6:157-95.  
 1944a. The Mexican species of *Phlepsius* (Homoptera: Cicadellidae). Ent. Soc. Wash. Proc. 46(4):85-94. 2 pls.  
 1944b. Nomenclatorial notes on Cicadellidae. Ohio Jour. Sci. 44(6):272.  
 1945. Some new species of *Cloanthanus* (Homoptera, Cicadellidae) from the eastern United States. Ohio Jour. Sci. 45(1):22-8. 2 pls.

## DeLong, Dwight M., and Lawrence Beery

1936. Studies of the genus *Scaphoideus* (Homoptera, Cicadellidae) Pt. 2. Ohio Jour. Sci. 36(6):334-42. 1 fig.

**DeLong, Dwight M., and J. S. Caldwell**

1936. A new genus, *Forcipata*, and nine new species of typhlocybine leafhoppers closely allied to *Dikraneura* (Cicadellidae: Homoptera). Ent. Soc. Am. Ann. 29(1):70-7, 2 pls.
1937. Some new species of *Idiocerus* (Homoptera-Cicadellidae). Ohio Jour. Sci. 37: 161-4.
1942. The genotype of *Forcipata* (Homoptera-Cicadellidae). Ent. Soc. Am. Ann. 35 (1):49.

**DeLong, Dwight M., and Oscar L. Cartwright**

1926. The genus *Chlorotettix*—a study of the internal male genitalia. Ent. Soc. Am. Ann. 19(4):499-511. 5 pls.

**DeLong, Dwight M., and Ralph H. Davidson**

1933. Same new species of *Eugnathodus*. Ohio Jour. Sci. 33(1):55-8.
1934. Some new species of Cicadellidae (Homoptera) from the United States. N. Y. Ent. Soc. Jour. 42:221-3. 1 pl.
1935. Some new North American species of deltocephaloid leafhoppers. Can. Ent. 67: 164-72. 1 pl.

**DeLong, Dwight M., and Ruth V. Hershberger**

1947. Some new species of *Idiocerus* (Homoptera: Cicadellidae) from the Upper Mississippi valley. Ohio Jour. Sci. 47(1):45-8. 1 pl.

**DeLong, Dwight M., and Dorothy J. Knull**

1945. Check list of the Cicadellidae (Homoptera) of America north of Mexico. Ohio State Univ. Grad. School Studies, Biol. Sci. Ser. 1. 102 p.

**DeLong, Dwight M., and Carl O. Mohr**

1936. Studies of the genus *Scaphoideus* (Homoptera-Cicadellidae) Pt. 1. Am. Midland Nat. 17(6):965-77. 1 pl.

**DeLong, Dwight M., and J. P. Slesman**

1929. New genera and subgenera from the genus *Deltocephalus*. Ent. Soc. Am. Annu. 22(1):81-114. 9 pls.

**Distant, William L.**

1907. Fauna of British India. Rhynchota 4(1):1-264. London.

**Donovan, Edward**

1799. The natural history of British insects 8. 88+4 pp., pls. 253-88. London.

**Dorst, Howard E.**

1931. Studies on the genus *Cicadula* (Homoptera, Cicadellidae). Kans. Ent. Soc. Jour. 4(2):39-48.
1937. A revision of the leafhoppers of the *Macrosteles* group (*Cicadula* of authors) in America north of Mexico. U. S. Dept. Ag. Misc. Pub. 271. 24 pp., 6 figs.

**Duméril, André M. C.**

1806. Zoologie analytique, ou méthode naturelle de classification des animaux. 343 pp. Paris.

**Edwards, John**

1922. A generic arrangement of British Jassina. Ent. Monthly Mag. 58:204-7.

**Fabricius, Johann C.**

1794. Entomologia systematica 4. 6+472 pp. Hafniae.
1798. Supplementum entomologiae systematicae. 2+572 pp. Hafniae.
1803. Systema rhynchotorum. 10+21+314 pp.+errata. Brunsvigae.

**Fallen, Carl E.**

1806. Försök till de Svenska Cicad-arternas. Handlingar Kongliga Svenska Vetenskaps-Akademiens 27:6-43. Stockholm.
1826. Hemiptera Sueciae. Cicadariae. 80 pp. London.

**Fieber, Franz X.**

1866. Neue gattungen und arten in Homopteren. Verhandlungen kaiserlich-königlichen Zoologische-Botanischen Gesellschaft, Wien 16:497-516. 7 figs. Vienna.
1868. Europäische neue oder wenig bekannte Bythoscopida. Verhandlungen kaiserlich-königlichen Zoologische-Botanischen Gesellschaft, Wien 18:449-64. Vienna.
1872. Katalog der Europäischen Cicadinen. 19 pp. Vienna.

## Fitch, Asa

1851. Catalog with references and descriptions of the insects collected and arranged for the state cabinet of natural history. N. Y. State Univ. Regents Ann. Rep. 4:43-69.

## Flor, von, Gustav

1861. Die Rhynchoten Livlands 2. 2+638 pp. Dorpat.

## Forbes, Stephen A.

1884. Thirteenth report, state entomologist on the noxious and beneficial insects of the state of Illinois. Ill. Dept. Ag. Trans. 21. 8+203+21 pp. (Separate pagination).  
1885. Fourteenth report, state entomologist on the noxious and beneficial insects of the state of Illinois. Ill. Dept. Ag. Trans. 22. 7+136, 108-20 pp. (Separate pagination).

## Forster, Johann R.

1771. Novae species insectorum; centuria 1. 8+100 pp. London.

## Fowler, W. W.

- 1896-1903. Biologia Centrali-Americana, Homoptera 2:129-68, 2 pls. (1896); 217-56, 3 pls. (1899); 265-92, 2 pls. (1900); 293-316, 2 pls. (1903).

## Germar, Ernst F.

1821. Bemerkungen über einige gattungen der Cicadarien. Magazin der entomologie 4:1-106. 1 pl. Halle.  
1833. Conspectus generum Cicadarium. Silbermann's Revue Entomologique 1:174-24. Paris.  
1834. Fauna insectorum Europae, fasc. 17:1. 25 pls. Halle.  
1839. Drei neue gattungen von Cicadinen. Zeitschrift für die Entomologie 1:187-92. Leipsig.

## Gibson, E. H.

1919. Five new species of Jassoidea from Honduras. Biol. Soc. Wash. Proc. 32:25-7.

## Gillette, Clarence P.

- 1898a. A few new species of *Deltocephalus* and *Athysanus* from Colorado. Colo. Ag. Expt. Sta. Bul. 43 (tech. ser. 3):23-9. 4 figs.  
1898b. American leafhoppers of the subfamily Typhlocybinae. U. S. Natl. Mus. Proc. 20(1138):709-73. 149 figs.

## Gillette, Clarence P., and Carl F. Baker

1895. A preliminary list of the Hemiptera of Colorado. Colo. Ag. Expt. Sta. Bul. 31 (tech. ser. 1). 137 pp., 57 figs.

## Gmelin, Johann F.

1790. Caroli a Linné systema naturae, thirteenth edition, 1(4):2041-224. Lipsiae.

## Griffith, Melvin E.

1936. *Alconeura* of the United States. Kans. Univ. Sci. Bul. 24:309-41. 4 pls.

## Hardy, James

1850. Descriptions of some new British homopterous insects. Tyneside Naturalists Field Club Trans. 1:416-31.

## Harris, Thaddeus W.

1841. A report on the insects of Massachusetts injurious to vegetation. 8+459 pp. Cambridge.

## Haupt, H.

1929. Neueinteilung der Homoptera-Cicadina nach phylogenetisch zu wertenden Merkmalen. Zoologische Jahrbücher. Abteilung für Systematik 58:173-286. 86 figs. Jena.

## Hepner, Leon W.

1939. New species of *Aligia* (Homoptera Cicadellidae). Kans. Ent. Soc. Jour. 12(4):105-17.  
1942. A taxonomic revision of the genus *Eutettix* in America north of Mexico (Homoptera, Cicadellidae). Kans. Univ. Sci. Bul. 28 pt. 2(13):253-93. 3 pls.  
1946. A new subgenus and several new species of *Scaphytopius* (Homoptera-Cicadellidae). Kans. Ent. Soc. Jour. 19(3):87-109.

## Herrich-Schaeffer, Gottlieb A. W.

1833. Faunae insectorum Germaniae initia (continuation of Panzer), fasc. 125. 24 pls. Regensburg.

**Herrich-Schaeffer—continued**

1838. *Faunae insectorum Germaniae initia* (continuation of Panzer), fasc. 153. 24 pls. Regensburg.

**Johnson, Dorothy M.**

1935. Leafhoppers of Ohio—Subfamily Typhlocybinae. *Ohio Biol. Surv. Bul.* 31. 122 pp., 5 pls.

**Kirkaldy, George W.**

1900. Bibliographical and nomenclatorial notes on the Rhynchota. *Ent.* 33:238–43. London.
1906. Leaf-hoppers and their natural enemies. Hawaii. Sugar Planters Assn. Expt. Sta. Div. Ent. Bul. 1(9):271–479.
1907. Leaf-hoppers—supplement. Hawaii. Sugar Planters Assn. Exp. Sta. Div. Ent. Bul. 3(1):1–186, 20 pls. Honolulu.

**Kirschbaum, Carl L.**

- 1858a. *Die Athysanus* arten der gegend von Wiesbaden. 14 pp. Wiesbaden.
- 1858b. Zerlegung der Gattung *Jassus* Germ. in weitere Gattungen. *Jahrbüchern des Vereins für Naturkunde in Herzogth Nassau* 13:355–8. Wiesbaden.

**Knull, Dorothy J.**

1940. New Cicadellidae (Homoptera). *Ent. News* 51:290–3.
1942. The genus *Neocollidia* in the United States (Homoptera: Cicadellidae). *Am. Midland Nat.* 28(3):680–92. 1 pl.
1944. Notes on leafhoppers with descriptions (Homoptera: Cicadellidae). *Ohio Jour. Sci.* 44:234–42. 1 pl.
1946. The genus *Bandara* Ball (Homoptera: Cicadellidae). *Ent. Soc. Am. Ann.* 39(2):259–64. 1 pl.

**Kuschakewitch, Jacob A.**

1866. *Dorycephalus* genre nouveau de Homoptères. *Horae Societatis Entomologicae Rossicae* 4:102–4. 1 fig. St. Petersburg.

**Lathrop, Frank H.**

1917. A preliminary list of Cicadellidae (Homoptera) of South Carolina. *Ohio Jour. Sci.* 17(4):119–31. 7 figs.

**Lawson, Paul B.**

1927. The genus *Jassus* in America north of Mexico. (Cicadellidae—Hemiptera). *Can. Ent.* 59:167–74. 1 pl.
1928. The genus *Driotura* Osborn and Ball and the genus *Unoka* gen. n. (Homoptera, Cicadellidae). *Ent. Soc. Am. Ann.* 21(3):449–62. 4 pls.
1929. Genus *Dikraneuroidea* gen. n. (Homoptera, Cicadellidae). *Brooklyn Ent. Soc. Bul.* 24(5):307–8. 1 pl.
- 1931a. The genus *Xerophloea* in North America (Homoptera, Cicadellidae). *Pan-Pacific Ent.* 7(4):159–69. 1 pl.
- 1931b. The genus *Drylix* in North America (Homoptera, Cicadellidae). *Ent. Soc. Am. Ann.* 24(3):587–90. 1 pl.
- 1932a. The genus *Tinobregmus* (Homoptera, Cicadellidae). *Ent. Soc. Am. Ann.* 25(2):359–65. 1 pl.
- 1932b. The genus *Spangbergiella* (Homoptera, Cicadellidae) in America north of Mexico. *Kans. Ent. Soc. Jour.* 5(4):116–22. 1 pl.
1933. A new *Penthimia* (Homoptera, Cicadellidae). *Kans. Ent. Soc. Jour.* 6(1):34–5. 8 figs.

**Le Baron, William**

1853. Observations upon two species of insects injurious to fruit trees. *Prairie Farmer* 13:330.

**Leonard, Mortimer D., and Cyrus R. Crosby**

1915. A new species of *Gonatocerus* (Mymaridae) parasitic on the eggs of a new species of *Idiocerus* (Bythoscopidae) feeding on poplar. *Jour. Econ. Ent.* 8(6):541–47. 2 pls.

**Le Pelletier de Saint-Fargeau, Amédée L. M., and Audinet Serville**

1825. *Evacanthus*, *Evacanthus* in *Encyclopédie Méthodique* 10. 833 pp. Paris.

## Lewis, R. H.

1835. Descriptions of some new genera of British Homoptera. Ent. Soc. London Trans. 1:47-52.

## Lindsay, Dale R.

1940. The genus *Norvellina* (Homoptera, Cicadellidae). Kans. Univ. Bul. 41(22):169-213. 8 pls.

## Linnaeus, Carolus

1758. Systema naturae, tenth edition 1. 2+824 pp. Holmiae.

## Marshall, T. A.

1866. An essay towards a knowledge of British Homoptera. Ent. Monthly Mag. 2:197-9. London.

## Matsumura, S.

1902. Monographie der Jassinen Japans. Termeszetrájsi Füzetek. 25:353-404. Budapesth.

## McAtee, W. L.

1919. A new genus for *Tettigonia trifasciata* Say (Homoptera; Eupterygidae). Biol. Soc. Wash. Proc. 32:121-3.  
1920. Key to the Nearctic species and varieties of *Erythroneura* (Homoptera, Eupterygidae). Am. Ent. Soc. Trans. 46:267-321. 1 pl.  
1924. Notes on eupterygid leaf-hoppers with descriptions of a few forms (Homoptera). Fla. Ent. 8:33-9.  
1926. Revision of the American leafhoppers of the jassid genus *Typhlocyba*. U. S. Natl. Mus. Proc. 68(18):1-47. 6 pls.

## Medler, J. T.

1942. The leafhoppers of Minnesota. Homoptera: Cicadellidae. Minn. Ag. Expt. Sta. Tech. Bul. 155. 196 pp., 9 pls.

## Melichar, L.

1924. Monographie der Cicadellinen-I. Annales Historico-naturales, Magyar Nemzeti Museum 21:195-243; 22:363. Budapesth.  
1926. Monographie der Cicadellinen-III. Annales Historico-naturales, Magyar Nemzeti Museum, 23:273-394. Budapesth.

## Metcalf, Z. P., and S. C. Bruner

1936. The Cicadellidae of Cuba. Puerto Rico Univ. Jour. Ag. 20:915-73. 6 pls. Rio Piedras, P. R.

## Nottingham, Jonathan O.

1932. The genus *Carneocephala*. Kans. Ent. Soc. Jour. 5(4):97-115. 2 pls.

## Oman, Paul W.

1931. Some new *Neocoelidia* with notes on other species. Kans. Ent. Soc. Jour. 4(3):62-8.  
1933. A classification of North American agallian leafhoppers. U. S. Dept. Ag. Tech. Bul. 372. 93 pp., 4 pls., 18 figs.  
1934. New species and a new genus of North American deltocephaline leafhoppers (Hemiptera: Homoptera). Ent. Soc. Wash. Proc. 36(4):75-80. 1 pl.  
1937. A generic revision of American Bythoscopinae and South American Jassiniae. Kans. Univ. Sci. Bul. 24(16):343-420. 9 pls.  
1938a. A contribution to the classification of South American agallian leafhoppers. Carnegie Mus. Ann. 25(22):351-460. 19 pls. Pittsburgh, Pa.  
1938b. Revision of the Nearctic leafhoppers of the tribe Errhomenellini (Homoptera: Cicadellidae). U. S. Natl. Mus. Proc. 85(3036):163-80. 2 pls.

## Oman, Paul W., and Raymond H. Beamer

1944. Some new species of *Cuerna*. Kans. Ent. Soc. Jour. 17:119-28.

## Osborn, Herbert

1894. Description of a new species of *Dorycephalus*. Can. Ent. 26(8):216.  
1898. Additions to the list of Hemiptera of Iowa, with descriptions of new species. Iowa Acad. Sci. Proc. 5:232-47. 2 figs.  
1900a. The genus *Scaphoideus*. Cincinnati Soc. Nat. Hist. Jour. 19(20):187-209. 2 pls.  
1900b. Two new species of Jassidae. Can. Ent. 32(9):285-6.

**Osborn—continued**

- 1900c. A new species of *Eutettix*. Ent. News 11(3):395-6.
- 1900d. A neglected *Platymetopius*. Ent. News 11(6):501-2.
- 1905a. Report of progress on study of the Hemiptera of Ohio. Ohio Nat. 5(4):273-6.
- 1905b. Jassidae of New York state. Report on the injurious and other insects of the state of New York 20:498-545. 3 figs.
- 1907. Descriptions of new forms of Jassidae. Davenport Acad. Sci. Proc. 10:163-6.
- 1911. Remarks on the genus *Scaphoideus*. Ohio Nat. 11(3):249-60.
- 1915. Leafhoppers of Maine. Maine Ag. Expt. Sta. Bul. 238:82-159. 24 figs.
- 1920. Notes on the generic affinities of certain Cicadellidae (Homoptera). Ohio Jour. Sci. 20(5):153-66. 8 figs.
- 1923. Some confused species of *Phlepsius* and *Eutettix* (Homoptera). Ohio Jour. Sci. 23:160-2.
- 1928. Leafhoppers of Ohio. Ohio Biol. Surv. Bul. 14:199-374. 111 figs.
- 1930. North American leafhoppers of the *Athysanella* group. Ent. Soc. Am. Ann. 23(4):687-720. 7 pls., 1 fig.
- 1932. Supplemental records and notes on Ohio leafhoppers. Ohio Jour. Sci. 32(6):513-7.

**Osborn, Herbert, and Elmer D. Ball**

- 1897. Contributions to the hemipterous fauna of Iowa. Iowa Acad. Sci. Proc. 4:172-234. 8 pls.
- 1898. Studies of North American Jassoidea. Davenport Acad. Sci. Proc. 7:45-100; 111-38. 6 pls.
- 1902. A review of the North American species of *Athysanus*. Ohio Nat. 2(6):231-56. 2 pls.

**Osborn, Herbert, and F. H. Lathrop**

- 1923. The genus *Phlepsius* in North America. Ent. Soc. Am. Ann. 16(4):310-62. 12 pls., 9 figs.

**Peters, Harold T.**

- 1933. The genus *Xestocephalus* (Homoptera, Cicadellidae). Kans. Ent. Soc. Jour. 6(3):73-80. 1 pl.

**Provancher, Abbé Léon**

- 1872. Descriptions de plusieurs Hémiptères nouveaux. Nat. Can. 4(11):350-2; (12):376-9.
- 1889-1890. Petite faune entomologique du Canada 3:205-92; 295-354. Québec.

**Reuter, Odo M.**

- 1880. Nya bidrag till Abo och Alands skärgårds. Hemipter-Fauna. Meddelanden-Societas pro Fauna et Flora Fennica 5:161-236. Helsingfors.

**Riley, Charles V.**

- 1880. A new leaf-hopper injurious to small grain. Am. Ent. 3(3):78.

**Robinson, William**

- 1926. The genus *Erythroneura* north of Mexico (Homoptera, Cicadellidae). Kans. Univ. Sci. Bul. 16(3):101-55. 8 pls.

**Sahlberg, John**

- 1871. Oefversigt af Finlands och den Skandinaviska halföns Cicadariae. Notiser Societas pro Fauna et Flora Fennica 12:1-506. 2 pls. Helsingfors.

**Sanders, J. G., and Dwight M. DeLong**

- 1917. The Cicadellidae (Jassoidea—Fam. Homoptera) of Wisconsin, with descriptions of new species. Ent. Soc. Am. Ann. 10(1):79-95. 2 pls.
- 1919. Eight new jassids from the eastern United States (family Cicadellidae). Ent. Soc. Am. Ann. 12(3):231-7. 24 figs.
- 1920. Four papers on Homopterous insects. Pa. Dept. Ag. Gen. Bul. 346:3-22. 5 pls., 1 fig.
- 1922. New species of Cicadellidae (Homoptera) from the eastern and southern United States. Ent. Soc. Wash. Proc. 24(4):93-100. 2 pls.
- 1923. Nine new species of Cicadellidae (Homoptera) from the United States and Canada. Ent. Soc. Wash. Proc. 25:151-6.

## Say, Thomas

1825. Descriptions of new hemipterous (and orthopterous) insects. Acad. Nat. Sci. Phila. Jour. 4:307-45.  
1831. Descriptions of new North American hemipterous insects. Acad. Nat. Sci. Phila. Jour. 6:299-314.  
1832. New species of North American insects found by Joseph Barabino chiefly in Louisiana. 16 pp. New Harmony, Ind.

## Scott, John

1873. On certain British Hemiptera-Homoptera. Ent. Monthly Mag. 9:264-6. London.

## Shaw, John G.

1932. The genus *Parabolocratus* in North America (Homoptera, Cicadellidae). Kans. Ent. Soc. Jour. 5:38-52. 3 pls.

## Signoret, Victor A.

1854. Revue iconographique des Tettigonides. Annales Société Entomologique de France, ser. 3, 2:5-28, 341-66, 483-96. Paris.  
1879- Essai sur les Jassides. Annales Société Entomologique de France, ser. 5, 9(1):  
1880. 47-92; 259-80. 4 pls.; ser. 5, 10(1):41-70. 2 pls.

## Sleesman, J. P.

1930. A monographic study of the North American species of *Euscelis* and allied genera (Homoptera-Cicadellidae). Ent. Am. n. s. 10(2):87-148. 10 pls.

## Spangberg, Jacob

- 1878a. Species Jassi generis Homopterorum. Förhandlingar Oefversigt af Kongliga Vetenskaps-Akademiens 35(8):3-40. Stockholm.  
1878b. Species Gyponae generis Homopterorum. Bihang till Kongliga Svenska Vetenskaps-Akademiens Handlingar 5. 75 pp. Stockholm.  
1879. Homoptera nonnulla Americana nova vel minus cognita. Förhandlingar Oefversigt af Kongliga Vetenskaps-Akademiens 36(6):17-26. Stockholm.

## Stål, Carl

1854. Nya Hemiptera. Förhandlingar Oefversigt af Kongliga Vetenskaps-Akademiens 11:230-55. Stockholm.  
1858. Kongliga Svenska Fregattens Eugenies resa omkring Jorden. Zool. 4(Hemiptera): 219-98. Stockholm.  
1859. Bidrag till Rio Janeiro taktens Hemipterfauna. Handlingar Kongliga Svenska Vetenskaps-Akademiens 3(6):1-75. Stockholm.  
1864. Hemiptera nonnulla nova vel minus cognita. Annales Société Entomologique de France, ser. 4, 4:47-68. Paris.  
1869. Hemiptera Fabriciana. Handlingar Kongliga Svenska Vetenskaps-Akademiens 8:58-86. Stockholm.

## Thomas, Ruth L.

1933. The genera *Stirellus* and *Commellus* (Homoptera, Cicadellidae). Kans. Ent. Soc. Jour. 6(4):126-36. 2 pls.

## Thomson, C. G.

1869. Oefversigt af Sveriges Coriser. Opuscula Entomologica 1:44-77. Lund.

## Thunberg, Carl P.

1784. Novae insectorum species descriptae. Nova Acta Upsaliae 4:1-28. 1 pl. Upsala.

## Uhler, Philip R.

1863. Hemipterological contributions. Ent. Soc. Phila. Proc. 2:155-62.  
1877. Report upon the insects collected by P. R. Uhler during the explorations of 1875. U. S. Geol. and Geog. Surv. Ter. Bul. 3(14):355-475. 2 pls. Washington, D. C.  
1879. On the Hemiptera collected by Dr. Elliott Coues, U.S.A., in Dakota and Montana, during 1873-74. U. S. Geol. and Geog. Surv. Ter. Bul. 4(22):503-12.  
1880. Remarks on a new form of jassid. Am. Ent. 3(3):72-3.  
1889. New genera and species of American Homoptera. Md. Acad. Sci. Trans. 1:33-6.  
1895. An enumeration of the Hemiptera-Homoptera of the Island of St. Vincent, W. I. Zool. Soc. London Proc. 1895:55-84.

## Van Duzee, Edward P.

- 1889a. Hemiptera from Muskoka Lake district. Can. Ent. 21(1):1-11.  
1889b. Review of the North American species of *Pediopsis*. Ent. Am. 5(9):165-74.



**Van Duzee—continued**

- 1890a. Descriptions of two jassids from the cranberry bogs of New Jersey. Ent. Am. 6(7):133-5. 3 figs.
- 1890b. New North American Homoptera. Can. Ent. 22(6):110-2; (12):249-50.
- 1890c. New California Homoptera. Ent. Am. 6(5):91-6.
- 1890d. Review of the North American species of *Bythoscopus*. Ent. Am. 6(12):221-9.
1891. New North American Homoptera. Can. Ent. 23(8):169-72.
- 1892a. North American Homoptera: revision of the North American species of *Phlepsius*. Am. Ent. Soc. Trans. 19(4):63-82. 1 pl.
- 1892b. New North American Homoptera. Can. Ent. 24(5):113-7; (10):266-8.
- 1892c. North American Homoptera: a synoptical arrangement of the genera of the North American Jassidae. Am. Ent. Soc. Trans. 19(12):295-307.
- 1892d. New North American Jassidae allied to *Thamnotettix*. Psyche 6:305-10.
1893. New North American Homoptera. Can. Ent. 25(11):280-5.
- 1894a. New North American Homoptera. Can. Ent. 26(4):89-93; (5):136-9.
- 1894b. A list of the Hemiptera of Buffalo and vicinity. Descriptions of some new North American Homopterous insects. Buffalo Soc. Nat. Sci. Bul. 5(16):167-216.
- 1894c. North American Homoptera: Catalog of the described Jassoidea of North America. Am. Ent. Soc. Trans. 21:245-317.
1907. Notes on Jamaican Hemiptera. Buffalo Soc. Nat. Sci. Bul. 8(5):1-79.
- 1909a. Observations on some Hemiptera taken in Florida in the spring of 1908. Buffalo Soc. Nat. Sci. Bul. 9:149-230.
- 1909b. Synonymical notes on North American Homoptera. Can. Ent. 41(11):380-4.
1910. A revision of the American species of *Platymetopius*. Ent. Soc. Am. Ann. 3(3):214-31.
1912. Synonymy of the Provancher collection of Hemiptera. Can. Ent. 44(11):317-29.
- 1915a. The North American species of *Draeculacephala*. Ent. News 26(4):176-80.
- 1915b. Nomenclatural and critical notes on Hemiptera. Can. Ent. 46(11):377-89.
1916. Check list of the Hemiptera (excepting the Aphididae, Aleurodidae, and Coccidae) of America north of Mexico. 11+111 pp. New York.
1917. Catalogue of the Hemiptera of America north of Mexico excepting the Aphididae, Coccidae, and Aleurodidae. Calif. Univ. Pubs. Ent. 2. 14+902 pp.

**Walker, Francis**

- 1851a. List of the specimens of Homopterous insects in the collection of the British Museum 3:637-907. London.
- 1851b. Insecta Saundersiana 2:76-156. London.
1858. Supplement to the list of the specimens of Homopterous insects in the collection of the British Museum. 369 pp. London.

**Walsh, Benjamin D.**

1862. Two new foes of the apple and pear. Prairie Farmer n. s. 10:147-9. 6 figs.
1864. On certain remarkable or exceptional larvae, coleopterous, lepidopterous, and dipterous, with descriptions of several new genera and species, and of several species injurious to vegetation which have been already published in agricultural journals. Boston Soc. Nat. Hist. Proc. 9:286-318. 7 figs.

**Woodworth, Charles W.**

1887. Jassidae of Illinois. Ill. State Lab. Nat. Hist. Bul. 3(2):9-37. 3 pls.

**Zetterstedt, Johann W.**

1828. Fauna insectorum Lapponica. 20+563 pp. Hammone.
1838. Insecta Lapponica descripta. Hemiptera: 253-314. Lipsiae.

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NATURAL HISTORY SURVEY DIVISION  
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Volume 24

BULLETIN

Article 3

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# The Bass-Bluegill Combination in a Small Artificial Lake

GEORGE W. BENNETT



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URBANA, ILLINOIS

*December 1948*

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*This paper is a contribution from the Section of Aquatic Biology.*

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The frontispiece shows wing nets being set in Fork Lake, 1939. In the first year of cropping, only two or three wing nets were required and these were set with individual leads that had no relation to one another. In other years, six wing nets were required and were arranged in such a way as to trap fish in all but the deepest part of the pond.





# The Bass-Bluegill Combination in a Small Artificial Lake

GEORGE W. BENNETT

TEN years ago, Fork Lake, a pond of 1.38 acres on the farm of Paul S. Smith near Mount Zion, Illinois, was probably typical of many of the older man-made ponds in central Illinois. When this pond was assigned for study to aquatic biologists of the Illinois Natural History Survey in 1938, it was 18 years old and had been used extensively for fishing, waterfowl shooting, and general outdoor recreation. A brief history of the recreational benefits derived from the pond has been published elsewhere (Thompson & Bennett 1939a).

With the outlawing of duck baiting and use of live decoys in 1935, the success of waterfowl shooting on Fork Lake was limited. Fishing, which was considered good from 1926 to 1930, had become poor through the development of large populations of black bullheads, carp, and buffaloes. These undesirable fishes apparently were limiting the success of reproduction and curtailing the growth rates of largemouth bass, crappies, bluegills, and other sunfish in the pond.

Fish in the pond were poisoned with rotenone on June 7, 1938, and a census was made of them (Thompson & Bennett 1939a). At this time, Fork Lake contained 5,350 fish weighing 774 pounds and consisting of 16 species. The rough fish, mostly carp and redmouth buffalo, made up 47.5 per cent by weight of all fish, and bullhead (plus four channel catfish) 42 per cent. Largemouth bass and panfish totaled only 6.3 per cent of the weight of all fish. The weight of fish per acre was 539 pounds, which indicated a moderately high natural fertility for the pond. At the time of the census, Fork Lake contained only 145 fish of desirable species and of a size large enough to interest anglers.

The pond was restocked between June 11 and 18 with 270 stunted adult bluegills,

*Lepomis macrochirus* Rafinesque, weighing about 40 pounds and 1,440 largemouth bass fry, *Micropterus salmoides* Lacépède, weighing 0.15 pound. Both the bluegills and the bass were taken from Homewood Lake, near Decatur, Illinois. The bluegills began to spawn almost at once; on June 22, 27 bluegill nests were counted. The bass averaged 0.87 inch total length when stocked, and, during October, 74 taken on fly-rod lures averaged 6.45 inches. Some of the young bluegills that were spawned in 1938 and escaped being eaten by bass were nearly 3.75 inches long by October; others were less than 0.75 inch.

Early in 1939 the decision was made to crop the new fish population by using 1-inch-mesh wing nets, 1-inch-mesh (bar) seines, and hook and line, and to determine the effect of such cropping upon this bass-bluegill population.

Cropping efforts resulted in a substantial yield of fish in 1939 (Bennett, Thompson, & Parr 1940). The annual yields of bluegills were smaller in 1940 and 1941. The yields of bass, although numerically smaller in 1940 and 1941 than in 1939, increased in total weight each year from 1939 to 1941, inclusive.

In the case of the bluegills, the first brood spawned in the lake grew more rapidly than all the others. Each successive brood of bluegills grew less rapidly than the preceding brood in spite of intensive cropping, which might have been expected to reduce the competition for food and result in improved rates of growth. Successive yearly yields in pounds of bluegills also progressively decreased. I believe that counter forces that reduced the food available for bluegills were responsible for the decline in yield and the absence of growth compensation.

Two possible causes for a reduction in bluegill foods, which may be assumed to

have been responsible for a reduced yield of bluegills, were (1) loss of fertility of the pond resulting from the removal of a large poundage of fish and (2) the spread of rooted aquatic plants to reduce greatly the area of open water.

The Fork Lake experiment was terminated by run-off water from a 4-inch rain that washed out the dam on July 8, 1942. As no Natural History Survey personnel were present at the time the actual break occurred, fish collected were those that remained in the pond after about two-thirds of the water had flowed out through the break, carrying with it a part of the fish population. In spite of this unfortunate circumstance, which eliminated the possibility of a final complete census of the fish, the partial census and the collections of previous years gave interesting and significant information on the bass-bluegill combination.

### Acknowledgments

Many persons assisted in the Fork Lake investigation. Dr. David H. Thompson initiated the study in 1938 and cooperated with the author on the field investigations in 1939 and on the preparation of the two preliminary Fork Lake reports. Mr. Sam A. Parr, formerly an Inspector with the Illinois Department of Conservation and now Superintendent of Fisheries with that Department, gave invaluable assistance in field observations and cropping. Assistance in collecting monthly quotas of fishes was given by many members of the Natural

History Survey staff, among whom were Dr. Donald F. Hansen, Dr. Louis A. Krumholz, Dr. Lee E. Yeager, Mr. Bruno von Limbach, Mr. Francis X. Lueth, Dr. C. L. Schloemer, and Dr. Gernon P. Hesselschwerdt. I am indebted to Mrs. Mary Shanor and Dr. Marian F. James, employed by the Natural History Survey for making stomach analyses of bass and bluegills. Dr. Herbert H. Ross, Systematic Entomologist of the Survey, and his staff gave valuable assistance to Mrs. Shanor and Dr. James in the identification of aquatic insects.

To Mr. Paul S. Smith, owner of Fork Lake, I am grateful for the use of the pond and for the many pertinent observations that he made during the early years of the experiment.

### Cropping Procedure

It was not feasible to take a large annual crop of fish by hook and line from Fork Lake; the Natural History Survey staff was unequal to the task and local people who cared to fish and who would keep records were few. Moreover, since many fish were needed for laboratory study, and a uniform sequence of collections was desirable, it was decided to crop the pond with nets and to augment the net catches with hook-and-line fishing. Nearly all anglers condemn the man who uses a trap net or seine as a game-fish poacher (whether the use of nets for commercial fishing is legal or not). Because such gear is frequently considered responsible for the

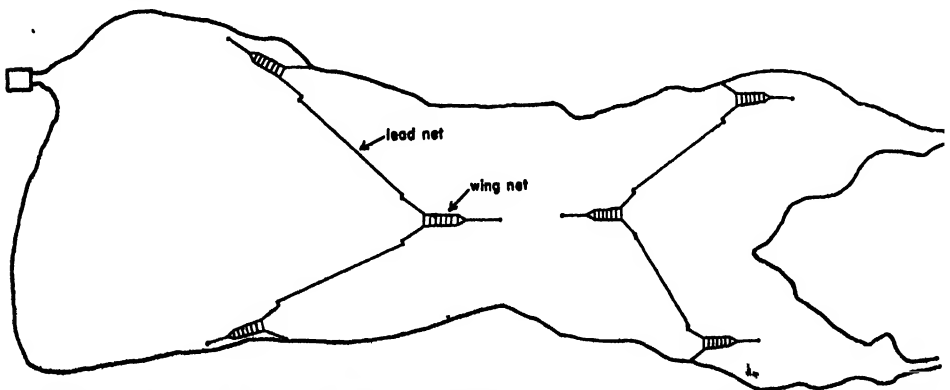


Fig. 1.—Outline map of Fork Lake, showing the customary set position of wing nets and lead nets used in cropping the pond during 1940, 1941, and 1942. It was not always possible to block off the pond completely as is shown, for the bottom near shore was often hard and frequently would not support the outer wing pole of a net. With the arrangements of nets shown here, no fish could swim for any great distance without running into a lead or net.

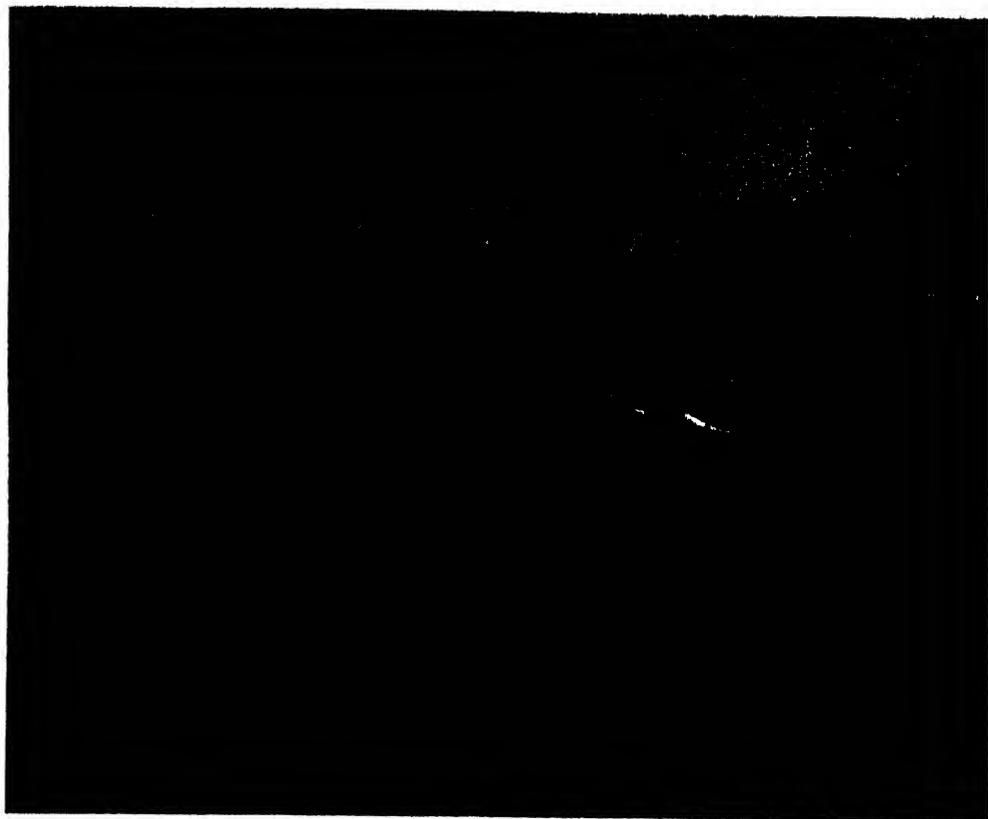


Fig. 2.—Six wing nets were needed to crop the fish in Fork Lake in 1940, 1941, and 1942. These nets were set in groups of three, with leads blocking the pond between them, as shown in fig. 1.

depletion of our game fishes, it seemed of considerable value to use this type of equipment in cropping the pond.

For a number of years, members of the aquatic biology staff of the Natural History Survey have used a wing net or fyke net for sampling fish populations in Illinois lakes and streams. This net, similar to the wing nets used by commercial fishermen on the Illinois River, consists of a tapered cylinder of webbing supported by hoops, open at the large end and closed at the small end by a drawstring. Inside are two funnels composed of webbing, the first located just inside the open end of the net and the second about two-thirds of the distance from front to back. Attached to the hoop at the large open end of the net are two pieces of webbing, the wings, that are spread when the net is set and that function in leading fish into the net much as the wing fences on a cattle chute lead in the cattle, fig. 1. A separate lead

net (much like a gill net or seine) is often used with a wing net to form an underwater "drift fence"; occasionally wing nets are set at both ends of such a lead net. Fish are believed to swim up to this lead, and follow it along until they find themselves within the mouth of the wing net. Wing nets are not ordinarily baited except for catfish; fish wander into the nets and are unable to find a way out. In shallow water these nets and leads are supported by long poles forced into the bottom mud. The webbing of legal commercial nets in Illinois must measure a minimum of 1.5 inches between knots on each of the four corners of a square mesh. Wing nets used at Fork Lake were of somewhat smaller mesh (0.50 to 0.75 inch) and would hold bass as small as 5 inches in length and bluegills of 3.5 inches.

Most of the cropping of Fork Lake was accomplished in 1939 by using two or three wing nets of 3.5 feet and 4.5 feet

in hoop diameter. In 1940 and later years, it became necessary to use six wing nets, four having front hoops of 3.5 feet in diameter and two having front hoops of 4.5 feet, fig. 2. In 1939, each wing net was supplied with a separate lead net; in 1940, 1941, and 1942, the six nets were set in two groups of three nets each with lead nets blocking the pond between them, as shown in fig. 1. With this arrangement, no fish could swim for any great distance without running into a lead or wing net.

Usually at 24-hour to 48-hour intervals after being set, nets were raised and the fish removed. Nets were moved frequently if they failed to catch fish. An attempt was made to fish the wing nets for a period each month from March to November of each year, beginning in March, 1939, and ending with the washout in July, 1942. Most of the fish caught were taken to the Urbana laboratories alive or iced, where they were weighed, measured, scaled, and dissected for stomachs and gonads. A small number of fish from Fork Lake were used to stock several new ponds constructed on farms near Mount Zion.

Some collections in early spring and late fall were made by seine hauls with a 100-yard, 1-inch-mesh seine. These hauls were necessary because the fish did not move enough to be caught in sufficient numbers in wing nets. Although some fish were taken with the seine, a satisfactory haul was difficult because of brush and snags in the bottom of the pond.

Table 1 lists the net-days of fishing in Fork Lake for the years 1939, 1940, 1941, and 1942.

The length of time that nets were fished each month usually depended upon the catch. If good catches (15 to 25 pounds of fish) were made, the nets were removed after two raises. If catches were poor, the nets were left in the lake as long as practicable. Table 1 indicates that more net-days of fishing were required with each succeeding year, and table 5 shows that in spite of an increase in net-days of fishing the total yield in pounds went down each year. This decrease in the fish yield produced by nets may have been influenced by one or both of two possibilities: (1) a reduction in the fish production of the pond and (2) a gradual improvement in the ability of the fish to avoid the nets or find a way out of them. Bass were much

more successful in avoiding nets than were bluegills. Even in 1939 so few bass entered the nets that angling was necessary to produce adequate samples. As the original bass fry grew larger, 1939-1942, they became more and more difficult to catch in nets. Bass of later broods, also, were caught more readily when small (5 to 7 inches) than when larger.

Bluegills were taken in nets most readily in the spring throughout April and May and more readily in fall than in summer. They were sometimes induced to move by violent storms or the flowing of warm water into the pond from the watershed. For example, nets set on March 9, 1942, caught few fish until a warm rain during the night of March 16 drained from the surrounding lands into the pond. When the nets were raised on March 17, they contained so many bluegills that some were replaced in the pond.

The amount of hook-and-line fishing done in Fork Lake to augment the catch of bass by nets was moderate. Nearly always done from a boat, fishing was with fly rod or bait rod and usually with artificial baits. Angling periods were usually short (one-half to 3 hours) and represented such time as was available on days when net raising or observations necessitated a trip to the pond. Hook-and-line catches varied from 16 fish per man-hour on May 6, 1941, to zero catches on several occasions. Table 2 gives the hook-and-line catch summary for years of the study and shows man-hours of fishing catch per man-hour, and numbers of bass and bluegills taken.

It is difficult to explain why no fish were caught on hook and line in 1942. Part of the failure to catch fish was due to a late, cold spring accompanied by excessive rainfall, which increased the turbidity of the pond and kept the water abnormally cold. The larger bass present (between 12 and 15 inches long and 1.0 and 1.5 pounds in weight) had become increasingly difficult to catch in 1941, and apparently had learned through observation (because bass were seldom returned to the water when caught) to ignore artificial lures. In 1942 the poorness of fishing gave the picture of a pond "fished out" for bass. That the lake was not "fished out" was shown by the catch of bass in the washout described later. Actually, during the spring of 1942,

Table 1.—Net-days of fishing with 1-inch-mesh wing nets in Fork Lake, March, 1939, to June, 1942.

MONTH	NET-DAYS OF FISHING			
	1939	1940	1941	1942
March.....	S-6*	S-3*	48	48
April.....	14	36	30	36
May.....	8	36	60	36
June.....	6	20	36	48
July.....	8	18	36	—
August.....	8	24	24	—
September.....	15	—	54	—
October.....	15	48	42	—
November....	18	S-2*	—	—
Total.....	92	182	330	168

\*S designates that hauls were made with a 100-yard, 1-inch-mesh seine; the numeral following the S indicates the number of such hauls.

Table 2.—Hook-and-line catch of largemouth bass and bluegills from Fork Lake, 1939, 1940, 1941, 1942.\*

YEAR	TOTAL MAN-HOURS OF FISHING	AVERAGE CATCH PER MAN-HOUR	NUMBER OF LARGE-MOUTH BASS	NUMBER OF BLUEGILLS
1939	27.0	1.37	34	3
1940	36.3	3.20	116	1
1941	42.3	2.90	122	28
1942*	26.5	0.00	0	0

\* March-June only in 1942. All other years March-October.

Fork Lake contained more than 75 bass of over 10 inches in length and many more of smaller sizes.

Fish were removed from Fork Lake when captured in wing nets, seines, or by angling, except in a few cases when the catch was less than 5 individuals, and in a single case (March 17, 1942) when more fish were caught than could be processed. By arrangement with the State Department of Conservation, state fish code restrictions were dispensed with; bass were taken during the closed season, and no length limits or creel limits were observed on either bass or bluegills.

On several occasions fish from Fork Lake were used for stocking other ponds. Adult fish used for this purpose were weighed and measured when caught. Bass and bluegill fry were measured and counted, and an estimate was made of their total weight.

## Fish Yield

The total yield of bass for the years 1939-1941 and the early part of 1942 is shown in table 3. The 1938 brood (original fry stocked) made up 87 per cent of the yield (weight) for all years, and, in the years in which cropping continued through November, the total weight of bass taken remained fairly constant at around 50 pounds (51.0, 53.9, and 57.7). No bass were spawned in 1939 because the original stock was not sexually mature in that year. Neither the 1940 nor the 1941 broods of bass were well represented in the net or hook-and-line catches, presumably because these broods were preyed upon by the original brood.

The number of bluegills taken from Fork Lake is shown in table 4. The original stock was sexually mature and produced a brood of young in 1938. Each year the bluegills produced a new brood, which usually appeared in large numbers in the nets during the following season. In 1940 some bluegill fry of the year were seined for stocking a nearby pond and some were trapped in the nets by strands of *Spirogyra* and failed to fall through the meshes. While it was readily possible to separate the original stock and the 1938 brood fish from later broods, the range in size of the individuals of the 1939, 1940, and 1941 broods overlapped so that separation of most bluegills into their various broods was done on the basis of scale studies. The original stock made up 16.5 per cent by weight of the total catch during the study, the 1938 brood 55.8 per cent, the 1939 brood 19.9 per cent, and the 1940 brood 7.7 per cent.

Table 5 gives a summary of the total yield of largemouth bass and bluegills taken from Fork Lake by netting and angling during the study. The yield of bass (1939-1941) showed a slight rise from 51 to 58 pounds, but that of bluegills dropped from 172 pounds in 1939 to 72 pounds in 1941. As may be seen from tables 1 and 2, the intensity of fishing both with nets and angling devices was increased with each successive year. The yield for the first 4 months of 1942 suggests that, if the cropping could have been continued through November, the 1942 yield of bluegills might have been nearly equal to that of 1941.

**Table 3.—Largemouth bass removed from Fork Lake, March–November, 1939, 1940, 1941; and March–June, 1942.**

BROOD	1939		1940		1941		1942		TOTAL		PER CENT OF TOTAL WEIGHT
	Number	Weight, Pounds	Number	Weight, Pounds	Number	Weight, Pounds	Number	Weight, Pounds	Number	Weight, Pounds	
1938*	349	51.0	208	52.7	72	39.6	10	17.4	639	160.7	86.6
1940	—	—	105	1.2	23	7.3	3	1.8	131	10.3	5.5
1941	—	—	—	—	91	10.8	27	3.7	118	14.5	7.9
Total	349	51.0	313	53.9	186	57.7	40	22.9	888	185.5	100.0

\*Original stock.

**Table 4.—Bluegills removed from Fork Lake, March–November, 1939, 1940, 1941; and March–June, 1942.**

BROOD	1939		1940		1941		1942		TOTAL		PER CENT OF TOTAL WEIGHT
	Number	Weight, Pounds	Number	Weight, Pounds	Number	Weight, Pounds	Number	Weight, Pounds	Number	Weight, Pounds	
Original stock	162	57.0	27	12.2	2	1.4	—	—	191	70.6	16.5
1938	773	115.0	427	108.0	35	13.3	7	2.7	1,243	239.0	55.8
1939	5	0.4	312	25.8	336	51.8	35	7.3	687	85.3	19.9
1940	—	—	246	0.3	145	5.5	193	27.2	584	33.0	7.7
1941	—	—	—	—	19	0.2	18	0.4	37	0.6	0.1
Total	940	172.4	1,012	146.3	537	72.2	253	37.6	2,742	428.5	100.0

**Table 5.—Yield of largemouth bass and bluegills from Fork Lake, March–November, 1939, 1940, 1941; and March–June, 1942.**

SPECIES	1939		1940		1941		1942	
	Number	Weight, Pounds	Number	Weight, Pounds	Number	Weight, Pounds	Number	Weight, Pounds
Largemouth bass.....	349	51.0	313	53.9	186	57.7	40	22.9
Bluegills.....	940	172.4	1,012	146.3	537	72.2	253	37.6
Total.....	1,289	223.4	1,325	200.2	723	129.9	293	60.5
Per acre.....	934	161.9	960	145.1	524	94.1	212	43.8

### Dam Failure

The Fork Lake cropping experiment was suddenly terminated by run-off from a 4-inch rain that occurred within a few hours, early in the morning of July 8, 1942, when the Fork Lake dam, fig. 3, constructed without expert engineering assistance and apparently riddled with muskrat burrows above the normal water

level, gave way near the middle, probably some time between 10:00 A.M. and noon. Dr. G. P. Hesselschwerdt and I were approaching Fork Lake at about 12:45 P.M. and, before we arrived within sight of the pond, we could hear the roar of water and realized the dam had washed out. At 12:45 about two-thirds of the total volume of water had poured out through the break. Much of the water must have flowed out

with the initial failure of the dam, as the corn stalks were flattened in the field below over a much wider area than the flow covered at the time of our arrival. Probably any fish that were in the pond area immediately adjacent to the break at the time it occurred were washed across the

with the outflowing water into the net. Bluegills seemed less able to adjust themselves to the situation and most of them were stranded in the pond basin.

When we attempted to collect the stranded fish by walking into the pond basin, fig. 4, each of us in turn became



Fig. 3.—Lower end of Fork Lake, showing the dam. Riprapping of broken concrete was held by fencing of wire mesh. This riprapping prevented washing from wave action but was attractive to burrowing muskrats.

cornfield and into the stream that winds through the valley below. Water continued to flow out of the basin until 2:20 P.M.

At the time of our arrival, we staked a short piece of 1-inch-mesh netting across the break in the dam to trap the larger fish still within the pond basin. Fifty-four bass and 10 large bluegills were taken in the net set across the break. All these fish made an active attempt to leave the lake with the water. Most of the bass held back until only about a foot of water remained in the basin; then many swam

mired in hip-deep silt a few feet from the former shore line. Because of the impossibility of collecting the fish, we made a careful count by walking around the shore line and listing the bass and bluegills as belonging to the various broods on the basis of size. As the pond was long and relatively narrow, we found it possible to walk along each side and count fish lying stranded in the strip of bottom from the shore line to the trickle of water running through the center of the basin. Probably some fish had become buried in the soft mud, and so escaped being counted.



The band of vegetation completely encircling the shore line and filling the upper one-fourth of the pond (see map, fig. 5) flattened down over the mud when the water flowed out of the lake and may have

As the last of the water was running out of the lake, several small muskrats left their burrows and ran around in the mud of the pond basin as if lost. Six adult bullfrogs crawled around in the mud. Many



Fig. 4.—The basin of Fork Lake at the time of the dam failure, July 8, 1942. The break in the dam occurred near the center, supposedly as a result of a heavy rain and muskrat tunneling above the normal water line. The bottom of the white exposed portion of the gage board (upper left) marks the former water level.

hidden a few additional large fish. This vegetation was covered by hundreds of small bass and bluegills that had wriggled to the surface of the vegetation mat with their dying exertions. We estimated that there were at least 10,000 bluegills between one-half and 2 inches long, and not less than 5,000 bass between 1 and 4 inches. After the count was completed, the bass and bluegills that were captured in the seine were taken to the laboratory and processed. Table 6 gives an estimate of the total number and weight of fish observed. The weight amounted to approximately 260 pounds.

Many bullfrog tadpoles, *Rana catesbeiana* Shaw, were also in the vegetation.

large clams, *Anodonta grandis* Say, were exposed and died after moving a few feet.

Experience in draining ponds for making fish censuses indicates that, when a body of water is rapidly drained, bass swim against the current and usually most of them remain in the pond until the water has been lowered to a certain level, when they appear to reverse their behavior and attempt to move through the outlet. Bluegills are weaker swimmers and consequently many are washed out with the water before the bass begin to appear in numbers at the outlet.

The break in the dam at Fork Lake was V-shaped. The initial flow of water was large and probably carried away many

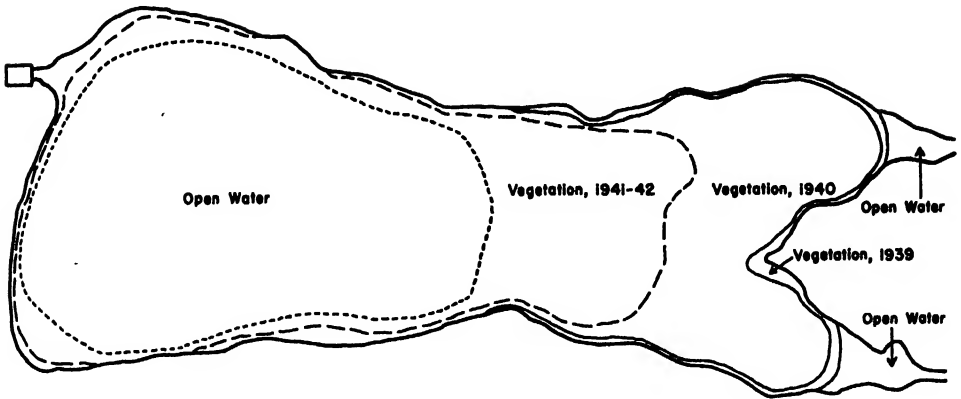


Fig. 5.—Outline map of Fork Lake, showing encroachment of the pondweed, *Potamogeton foliosus* Rafinesque, on the pond shallows. In 1939, plants of this species occupied a narrow band around the shore of the upper one-third of the pond; in 1940, it spread into water 3 to 4 feet in depth and encircled the pond shore line; in 1941 and 1942, it filled the shallows up to 5 or 6 feet in depth, leaving only a little more than one-half of the pond area in open water. Open water was always present in the upper forks of the pond because overhanging trees completely shaded these pockets.

more bluegills than bass. What the total weight of the population was can be only conjectured. The deep, open water in the region of the dam was of a type attractive to bluegills beyond the size range of bass food. Certainly the numbers of fish actually observed indicate that the pond contained a large fish population in spite of 3½ years of heavy cropping with nets, and the many small fish inhabiting the vegetation indicate a very successful spawn in 1942.

### Pond Habitat

No attempt was made to study the plankton or the invertebrate or vertebrate fauna of Fork Lake other than the fish, except when an abnormal abundance of some species could not escape observation or when plants or animals other than fish appeared in the nets.

The most obvious change in the pond habitat during the 4½ years it was under observation resulted from the spread of a

Table 6.—Fish observed at Fork Lake at the time of the dam failure of July 8, 1942.

BROOD	MEASURED AND WEIGHED INDIVIDUALLY			COUNTED BUT NOT WEIGHED		ESTIMATE OF TOTAL OBSERVED POPULATION	
	Number	Total Weight, Pounds	Average Weight, Pounds	Number	Estimated Weight, Pounds	Number	Weight, Pounds
Largemouth bass							
1938.....	34	59.7	1.76	32	56.3	66	116.0
1940.....	4	4.7	1.17	7	8.1	11	12.8
1941.....	16	12.6	0.79	16	12.5	32	25.1
1942.....	—	—	—	—	—	5,000	15.0
Total.....	54	77.0	—	55	76.9	5,109	168.9
Bluegills							
1938.....	10	5.7	0.57	20	11.3	30	17.0
1939 and 1940..	—	—	—	278	50.0	278	50.0
1941 and 1942..	—	—	—	—	—	10,000	25.0
Total.....	10	5.7	—	298	61.3	10,308	92.0

species of rooted aquatic vegetation, namely the fine-leaved pondweed, *Potamogeton foliosus* Rafinesque. Previous to the complete removal of fish in 1938, the pond contained no aquatic vegetation because the activities of bottom-rooting fish kept the water very turbid. The replacement of these fish by largemouth bass and bluegills allowed the silt to settle, and after June of 1938 the pond was turbid only following heavy rains. The source of silt was a clay fill for a road about 150 yards above the pond. Most of the rest of the drainage basin was in timber and grass. The reduced turbidity of the pond was not immediately followed by a growth of aquatic plants; a few bunches of fine-leaved pondweed appeared in the late summer of 1938.

By midsummer of 1939 a dense, narrow band of *Potamogeton foliosus* was growing in water from the shore out to a depth of 2 feet along the shore line of the upper one-third of the pond. In 1940, the fine-leaved plant spread into deeper water at the upper end of the pond and extended its distribution to form a band along the entire shore line of the pond—the edge of this band farthest from shore extended into water between 3 and 4 feet in depth. A vegetation map of the pond was made at the period of maximum plant growth in early August, fig. 5. When the open water of the pond was measured with a planimeter on this vegetation map, it was found to be slightly more than 0.95 acre, as compared with an open water area of 1.25 acres in 1939. The plants in this band of vegetation extended to the surface and were so thick that it was difficult to row a boat through them.

The following year (1941) the potamogeton extended its growth into still deeper water, fig. 5. The maximum depth at which the plants reached the surface was 6 feet, and most of the shore band of plants extended to depths a little beyond 5 feet. A measurement of the open water as outlined on a vegetation map made July 28 gave an area of 0.64 acre.

By the time the 1941 vegetation map was made, a circular area of approximately 10 feet in diameter, at a point near shore immediately between the forks of the upper end of the lake, had become completely denuded of plants. As a heavy growth of plants had been present in this location

earlier in the summer, the barren area was recorded. The water in the barren area was clear and it was possible to see bottom there. The water depth of this area ranged from 1 foot near shore to 3 feet at the outer edge of the opening.

The pond was not visited again until August 19, 23 days after the vegetation was mapped. On this date the *Potamogeton foliosus* was completely gone, except for a few scattered stalks at the water's edge, and the water was turbid with a "bloom" of algae, *Aphanizomenon flos-aquae* (Linnaeus), that obscured a Secchi disk lowered to 1.2 feet. Whether the small open area observed the latter part of July represented the beginning of a progressive die-off of the potamogeton is not known. A few small bunches of *Potamogeton nodosus* Poiret growing in shallow water along the south shore seemed to be unchanged. This phenomenon of a sudden die-off of *P. foliosus* in midsummer had been observed in one other experimental pond. In both instances, however, it was a "before and after" observation; neither pond was observed during the progress of the die-off.

The cause of this sudden die-off is unknown and it is believed to be of uncommon occurrence. Usually, dense mats of *Potamogeton foliosus* remain until late September, when they gradually break loose from their attachments and float free for some time before finally disintegrating. The phytoplankton "bloom" that followed the disappearance of the potamogeton is believed to have resulted from the release of plant nutrients into the pond water.

In 1942, in spite of a late, wet season, the fine-leaved pondweed again appeared in abundance and by the latter part of June had grown to fill the same parts of the pond that had been filled the preceding year.

It is probable that the application of the rotenone in June of 1938 killed not only the fishes but also the Entomostraca and, where excessive concentrations occurred, a part of the insect larvae of the littoral zone and the benthos (Smith 1940; Brown & Ball 1943). The rapid growth of bass fry and bluegills during the summer indicates that replenishment of small aquatic invertebrates must have taken place within a very short time. The result of a sudden catastrophe, such as rotenone treatment of a pond, is often a simplification of the in-

vertebrate fauna, some species disappearing entirely and other forms disappearing temporarily but reappearing later in eruptive numbers. This reaction is assumed to have taken place in 1938 in Fork Lake, particularly among the smaller invertebrates.

Fork Lake contained a number of adult bullfrogs, *Rana catesbeiana*, and their tadpoles were extremely numerous throughout the summer of 1938. The only other year in which tadpoles were present in large numbers was 1941, although a few could be seen at almost any time among the aquatic vegetation.

Crayfish, *Cambarus virilis* Hagen and *C. propinquus* Girard, must have been fairly abundant throughout the period of cropping of the pond, as large adults were taken often in wing nets. Both snapping, *Chelydra serpentina* (Linnaeus), and painted turtles, *Chrysemys picta marginata* (Agassiz), found a way into nets and frequently were drowned before the nets were raised. In some raises the poundage of turtles greatly exceeded that of fish. Snapping turtles removed from the pond in 1939 were 9 weighing 28.7 pounds; in 1940, 11 weighing 23.2 pounds; in 1941, 5 weighing 14.5 pounds; and in 1942, 3 weighing 7.1 pounds. The painted turtles removed in 1939 were 32 weighing 20.3 pounds; in 1940, 8 weighing 7.6 pounds; in 1941, 6 weighing 6.8 pounds; and in 1942, 4 weighing 5.3 pounds. Turtles found dead in the nets were removed from the pond. Some of the live turtles caught in nets were removed for laboratory study or for table use. Others caught were released.

downward from 1939 through 1941, in spite of an increased intensity of fishing with nets and an increase in man-hours of angling, the mat-forming aquatic vegetation continued to spread. While other factors undoubtedly reduced the yield of fish from the pond, I believe that the increased abundance of plants was the most important factor.

A comparison of the yields of fish with the areas of open water is shown in table 7. The yields of fish are, of course, not exactly proportional to the areas of open water in the pond. But even though netting and angling pressures were increased during the 3 years, and many other factors probably influenced the fish yield, a remarkably close parallel existed between the fish yields and the open pond acreages, table 7. Swingle (1945) investigated a pond that became filled with a heavy growth of naiad, *Najas guadalupensis* (Sprengel), during years when this plant was not shaded out by muddy water. He concluded that the rank plant growths did not reduce the production of fish but did materially reduce the hook-and-line yield. Although information on the total weight of the fish population of Fork Lake, before and after the plants became abundant, is not available, the evidence presented in table 7 and the fact that the growth rate of bluegills became slower in spite of heavy cropping (see section following) suggest that the production of food available to fish in the pond was actually reduced by *Potamogeton foliosus*.

### Growth Rates

The growing season for Fork Lake fish (water temperature above 55 degrees F.) was determined to be about 6 months long in 1939 (Bennett, Thompson, & Parr

### Vegetation vs. Fish Yield

At the same time that the annual poundage of fish from Fork Lake went steadily

Table 7.—Yield of fish, fishing effort, and approximate area of open water in Fork Lake, 1939, 1940, and 1941.

YEAR	YIELD		AREA OF OPEN WATER		NET-FISHING INTENSITY		ANGLING INTENSITY	
	Pounds	Per Cent of 1939 Yield	Acres	Per Cent of 1939 Area	Net-Days	Per Cent of 1939 Net-Fishing	Man-Hours	Per Cent of 1939 Angling
1939..	223.4	100.0	1.25	100.0	92	100.0	27.0	100.0
1940..	200.2	89.6	0.95	76.0	182	197.8	36.3	134.4
1941..	129.9	58.1	0.64	51.2	330	358.7	42.3	156.7

1940), and probably the growing season length varied from this time no more than a few weeks in other years.

These relatively small differences in the growing seasons had less influence upon fish growth than such factors as available food and related competition for food.

Frequent collections and examinations of fish from Fork Lake gave total length measurements that were useful in plotting

lected and preserved between late June and mid-September, 1938.

The 270 bluegills that were moved to Fork Lake from Homewood Lake between June 11 and 18 were very thin and were between 5 and 7 inches total length. On the basis of the first spring collection of the following year, these fish may be said to have grown rapidly in 1938; they averaged 7.6 inches in March, 1939. Many

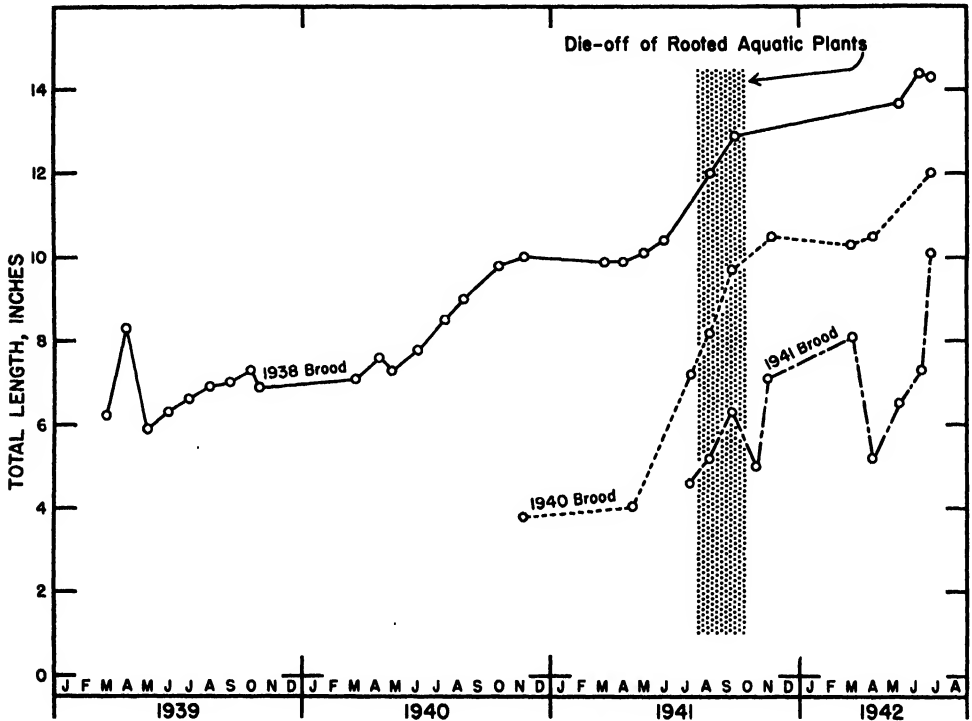


Fig. 6.—Average rates of growth of 1938, 1940, and 1941 broods of largemouth bass in Fork Lake.

average lengths of the various broods, figs. 6 and 7. Whenever possible, the broods of each species were separated by a study of scale patterns and counts of annuli. In a few cases, where fish were used for stocking other waters, no scales were taken. These fish were assigned to various broods on the basis of size.

The growth of the 1938 brood bass seined from Homewood Lake and stocked in Fork Lake on June 23, 1938, was at first very rapid. When released these bass fry averaged 0.87 inch, and 74 of them caught in October, 1938, averaged 6.45 inches total length (Thompson & Bennett 1939a). One hundred sixty-one were col-

lected and preserved between late June and mid-September, 1938.

A number of fish were taken by angling and minnow seining in 1938 as a means of following growth rates of the two species: 161 bass, 2 adult bluegills, and 34 of the 1938 brood bluegills. Thus, when systematic cropping was begun in March, 1939, the original fish population had been reduced to a figure that did not exceed 1,279 bass and 268 bluegills. Throughout the period of study only 866 bass and 193 bluegills of the original stock were recaptured.

In 1939, the bass increased in length very little, presumably because so many bass were present in the pond that the available food supply was inadequate for their requirements. Bass collected in

7, which may denote some growth, although this is largely obscured by a considerable variation in sizes (and ages) of individuals trapped. As male bluegills usually average larger than females for

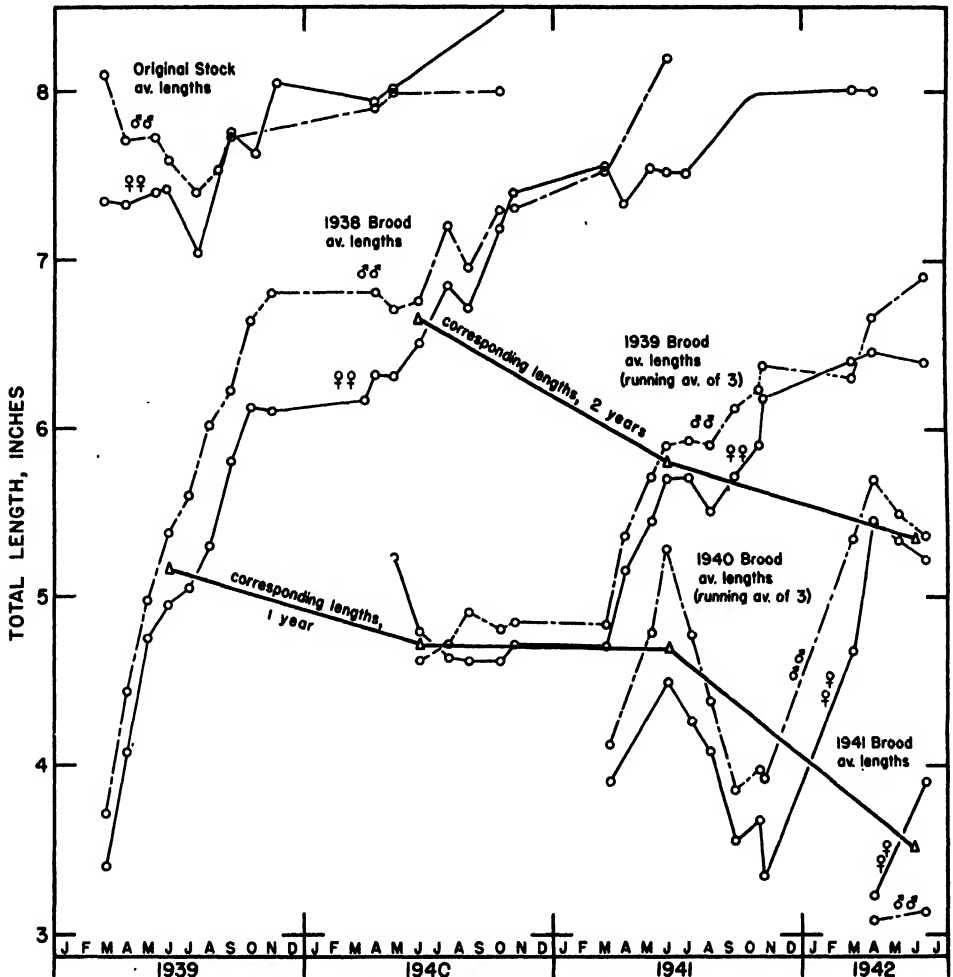


Fig. 7.—Average rates of growth of original stock and the four broods of bluegills spawned in Fork Lake, 1938–1941. As males usually average larger than females, the curves representing the sexes are separated. Corresponding average lengths of fish of the several broods at 1 and at 2 years of age are indicated to show the decrease in growth rate throughout the period of sampling.

March averaged 6 inches. A number of "cannibals" (Cooper 1937) collected in April materially raised the average length for that month; the average length of bass taken in October was only 7 inches, fig. 6. The original bluegills, with an indicated average length of about 7.5 inches by the fall of 1938, showed a fluctuation in average length of fish caught during 1939, fig.

any given age, points representing the average lengths of males and of females in fig. 7 are separated.

The growth of the 1938 brood bluegills was rapid in 1939, fig. 7; fish taken from the pond averaged 3.5 inches in March and nearly 6.5 inches in October. The indicated increase in average size of these bluegills between March and April, 1939,

may not have been due entirely to growth; it is presumed that many of the smaller fish of this brood were eaten by bass at this time and so were unavailable to influence the average lengths of later collections. This assumption is substantiated by the appearance of annuli on the scales of the 1938 brood bluegills. The annuli appeared largely between the April and May collecting periods (Bennett, Thompson, & Parr 1940, fig. 6) and were believed to mark the resumption of growth in the spring.

The large number of bass fry used in stocking the pond reduced the numbers of the 1938 brood bluegills to a point where those that escaped capture made excellent growth in 1939. Yet the increase in size of the bass increased their own food requirements to such an extent that the spawn of the remaining original bluegills plus that of the now sexually mature 1938 brood could not furnish sufficient food for the bass. This situation resulted partly because bass raided the bluegill nests and ate the newly hatched fry before they attained a substantial size. Thus, in 1939, growth conditions in Fork Lake were favorable for bluegills too large for bass to eat (above 3.5 inches in length) but were unfavorable for bass.

Similar conditions obtained in the early part of the 1940 growing season, although the number of bass had been reduced by 349, more than half (162 of 268) of the original bluegills had been taken, and 773 of an unknown number of 1938 brood bluegills had been netted and removed in 1939. The bass showed little growth in the first 3 collecting months. After the advent of the 1940 spawning season, when both young bass and young bluegills were available for food, the average lengths in the 1938 brood bass collections increased from about 7 to 10 inches.

Bluegills of the original stock and the 1938 brood continued to grow at a satisfactory rate in 1940. The number of the original stock taken was small (27) and lengths varied as in 1939. Bluegills of the 1938 brood, which averaged about 6.5 inches at the beginning of the 1940 growing season, averaged about 7.4 inches by November. Four hundred twenty-seven of the 1938 brood were taken in 1940 and, as in 1939, this brood made up the bulk of the bluegill crop. A few 1939 brood

bluegills were taken in October, 1939; they appeared again in nets in May and June, 1940, and were present in all later collections. The average size of the members of this brood in collections did not increase during the season. This lack of size increase was due probably to net selectivity; that is, the collections of early months contained only the larger fish of this brood. Two hundred forty-six bluegill fry of the 1940 brood were taken during the summer and most of these were used to stock other ponds.

By March, 1941, 718 of the 1,440 original stock of bass had been recaptured; many more had probably been lost through cannibalism and other causes. The remaining bass made little growth during the spring and early summer months of 1941.

The 1940 brood bass, the first brood spawned in the pond, appeared in the November collection of that year; the average length of 8 of these was 4.0 inches as compared with an average length of 6.45 inches for 74 of the 1938 brood bass at the end of their first season of growth. Few of the 1940 brood bass were taken until the latter part of July, 1941, when those collected averaged 7.2 inches in length. The plant die-off early in August left small bass and small bluegills without the protection of the mats of vegetation. In the next 3 months, August through October, the increase in average lengths of bass collected indicated that individuals of all broods made remarkable growth. In the collections, the 1938 brood bass averaged less than 10.5 inches in June and 13.0 inches in October; the 1940 brood, 7.0 in June and 10.5 inches in October; and the 1941 brood (spawned that season) nearly 6.5 inches in October.

By 1941 the original and the 1938 brood bluegills were becoming scarce. Only 2 of the original and 35 of the 1938 brood bluegills were taken in that year. Bluegills of the 1939 brood, which made up the bulk of the 1941 bluegill catch, were less numerous and averaged so much smaller in size than the 1938 brood when of comparable age that the total weight of the 1941 bluegill crop was less than half of that of the 1940 crop, table 5. The 1939 brood bluegills collected averaged about 4.8 inches in March of 1941 and 6.3 inches at the end of the growing season.

The sizes of individuals in the collections of 1940 brood bluegills in 1941 varied over a large range, and the growth curve as plotted in fig. 7 shows a continuous decrease in average length from a high in June to a low in November. This decrease was due in part to the selectivity of nets; early in the season the nets held only the largest members of the brood, which were few in number, while later the more numerous smaller members had grown large enough to be held by 1-inch mesh. The average length of these second-year fish in June was 4.7 and in October–November 3.8 inches. Although 145 of these fish were taken in 1941, their combined weight was only 5.5 pounds.

The average sizes of bluegills taken during and after the plant die-off of August, 1941, showed no increase comparable to that found in bass, and it must be assumed, therefore, that no comparable improvement in bluegill food supply resulted from the "bloom" of algae that followed the *potamogeton* die-off.

Relatively few bass were taken in the March–June collecting period of 1942 but, of the fish collected after the wash-out, 34 bass of the original stock averaged 14.2 inches and 1.76 pounds at 4 years; 4 of the 1940 brood, 12 inches and 1.17 pounds at 2 years; and 16 of the 1941 brood, 10 inches and 0.79 pound at 1 year. The large size of the bass of the 1940 and 1941 broods was due largely to growth made during the plant die-off period of 1941.

Four broods of bluegills were represented in the 1942 collections: 7 bluegills of the 1938 brood averaged 8.0 inches at 4 years; 35 of the 1939 brood, about 6.6 inches at 3 years; 193 of the 1940 brood, about 5.5 inches at 2 years; and 18 of the 1941 brood, about 3.5 inches at 1 year. Bluegill growth was consistently poorer with each successive year, fig. 7, in spite of heavy cropping. This slow growth rate is believed to have resulted from a reduction in the available food supply associated with the spread of the plant, *Potamogeton foliosus*.

### Condition and Growth

Condition, or relative plumpness, of fish is a measurement of some value in pond management. A high average condition

usually indicates an abundance of available food in relation to the number of fish present, and a low average condition denotes slow growth and undue food competition.

The index figure indicating condition of bass and bluegills, as calculated by any of several recognized formulas, increases with an increase in the length of the fish even for fish apparently of the same relative plumpness. The form of both bass and bluegills changes somewhat throughout their length range.

In this manuscript the Index of Condition formula (Thompson & Bennett 1939b) has been used:

$$\text{Index of Condition} = \frac{W}{L^3} \times 10000$$

W represents weight to the nearest hundredth pound, and L represents total length to the nearest tenth inch.

When this formula is used on lengths and weights of bass within the length range of 5 to 15 inches, an Index of Condition figure of 3.5 to 4.5 denotes a fish in poor flesh; 4.6 to 5.5, one of about average or normal plumpness; and 5.6 to 6.5, a very fat fish.

In bluegills, the increase in index figure with increasing size is more pronounced than in bass, but in fish of 5 to 8 inches an Index of Condition figure of 7.0 or below denotes a fish in poor flesh; 7.1 to 8.0, one of normal or average plumpness; and above 8.0, one of unusual plumpness.

The condition curve for 1938 bass in 1939, plotted in fig. 8, shows that fish of this brood were within the range of normal condition during April, May, and June, then dropped into the thin classification, and remained there until July, 1940. This period coincides with the period of very small length increase (March, 1939–June, 1940) cited above in the discussion of growth. After the bass and bluegills had spawned in 1940, bass of the 1938 brood began to grow, and their condition curve rose gradually to 5.0 and slightly above. These bass remained within the range of normal plumpness until the period of vegetation die-off and "bloom," when they became very fat and their condition curve rose rapidly to 6.15. A drop to normal followed, but in 1942 the condition curve of the 1938 brood again rose above 6.0. The spectacular rise in the condition curve of bass of the 1938 brood dur-



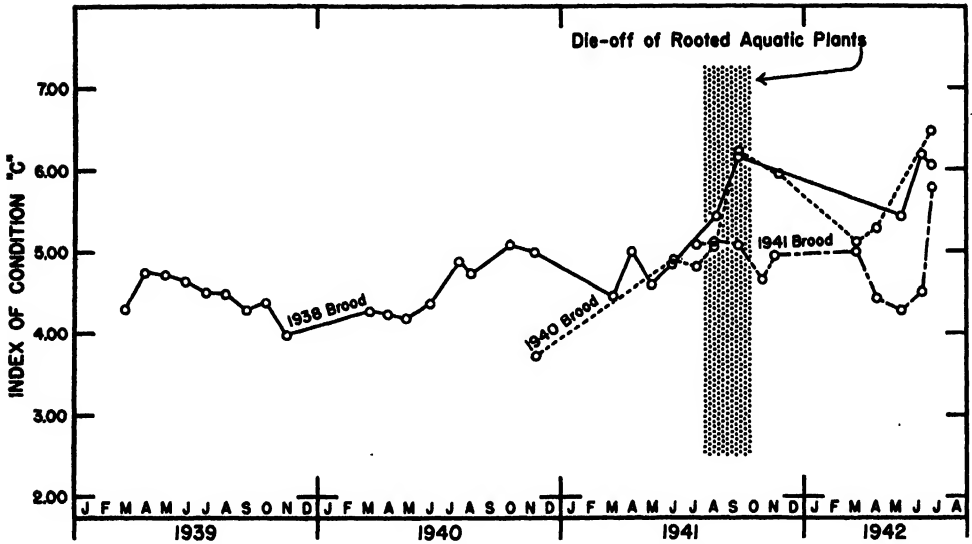


Fig. 8.—Average Indexes of Condition of the 1938, 1940, and 1941 broods of bass in Fork Lake, 1939–1942. An Index of Condition of 3.5 to 4.5 denotes a fish in poor flesh; 4.6 to 5.5, about average or normal; and 5.6 to 6.5, very fat.

ing the “bloom” of 1941 is paralleled by a similar rise for bass of the 1940 brood, and in each brood the rise is followed by a drop in the late fall and early spring following and a rise with the last collections of 1942.

Bass of the 1941 brood appeared in the catch about the time of the “bloom” and showed less influence from it. However, these bass were much smaller than the members of the other broods, and their Index of Condition of 5.10 is considered

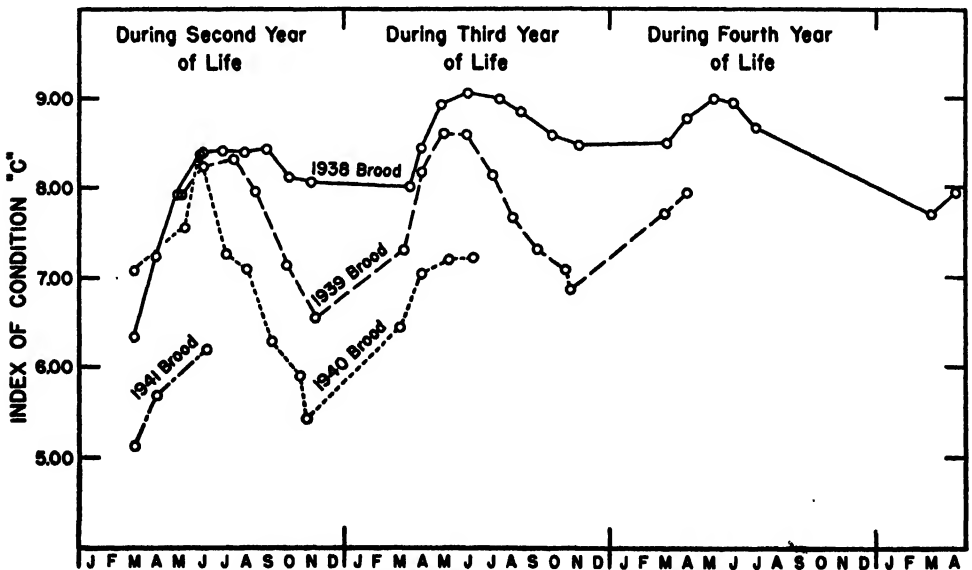


Fig. 9.—Average Indexes of Condition of the several broods of bluegills spawned in Fork Lake, 1938–1941, arranged to show average condition of these fish at comparable ages. The condition cycle of bluegills in Fork Lake is characterized by a high in May and a low in November. Bluegills with a condition factor of 7.0 or below are thin; those with a factor of 7.1 to 8.0 are normal or average; and those above 8.0 are unusually plump.

high. The early spring collections of 1942 showed a marked drop in Index of Condition of the 1941 brood, but improvement to 5.77 in early July.

As bluegills showed no increase in length or improvement in condition coinciding with the 1941 plant die-off, condition curves for bluegills are plotted to show comparable conditions of the several broods of bluegills at comparable ages, fig. 9. Throughout the period of study (except for the first few months when the fish were very small) the average condition for the 1938 brood bluegills was highest in early summer, but the curve remained always above 8.0, indicating that the fish were unusually plump. Other broods showed a rise in condition during the spring months to a point above 8.0, followed by a severe drop in or after July to a low in November. The drop was much more pronounced in the 1939 and 1940 broods than in that of 1938. A regular cycle of condition, probably influenced by spawning, seems to be characteristic of this species. The cycle reaches a high in early summer and a low in late fall. The fluctuations in the bluegill cycle must be considered when judging the condition of bluegills from a selected body of water on the basis of a single collection.

### Scale Analysis

Annual rings, or annuli, that appear on fish scales are used frequently by aquatic technicians to determine age of fish. The validity of this practice has been tested for only a few species, although fisheries biologists, including the author, have applied the practice of "scale reading" to many species of fresh-water fishes.

This study of bass and bluegills in Fork Lake gave a good opportunity to determine the validity of the scale method of age determination in these species, particularly in the original bass stocked as fry in 1938 and in the 1938 brood bluegills. As the original bass fry did not become sexually mature in 1939, no new brood of bass appeared until June, 1940, so that throughout the period of study the original bass could be separated from the 1940 and 1941 broods on the basis of size. The 1938 brood bluegills grew rapidly during their first 2 years (1938-1939) in the pond; this rapid growth, and the fact that body

length, weight increases, and scale growth were followed from month to month throughout the growing seasons of 1939, 1940, 1941, and a part of 1942, gave assurance as to the correct identification of this brood in all collections.

In a previous study of the scales of Fork Lake bass and bluegills collected in 1939 (Bennett, Thompson, & Parr 1940), the annuli were found to appear on the scales at about the time growth was resumed following a period of dormancy (winter). The length of the period during which individual fish of a given brood were in the process of forming annuli seemed to depend upon the amount of food available for that species of fish within the brood size range at the beginning of the growing season. If acceptable food was abundant, the beginning of growth was controlled by the temperature of the warming water, and most of the fish began to grow at about the same time. The appearance of the annulus, being dependent upon the addition of concentric ridges of new material (circuli) on the scale margins, was closely associated with a length increase of the fish body. If acceptable food was relatively scarce at a time when temperature conditions were favorable for rapid growth, the beginning of body growth within a brood of fish was delayed until the individual members were able to ingest a quantity of food in excess of body maintenance requirements, and annulus formation was prolonged over a much greater period than when food was abundant. There is no evidence to indicate that the annuli on the scales of warm-water fishes are more than visible marks produced by alternate periods of scale growth and growth stoppage. While the cessation of body growth and scale growth of fishes in winter is the result of low water temperatures which reduce the rate of metabolism, conditions might occur during the growing season (summer) which would stop growth, and, if growth were resumed later, produce false annuli.

False annuli, which appeared on the scales of both the 1938 brood bass (original stock) and 1938 brood bluegills in mid-summer of 1939, were quite common (Bennett, Thompson, & Parr 1940). While these marks were indistinct on the scales of many fish, on others they were very definite and were indistinguishable

from true annuli formed earlier in the season. The identification of these clear marks as false annuli aroused questions as to the validity of the scale method of age determination. Therefore, it was important to determine the percentage of clear false annuli among the broods of bass and bluegills in Fork Lake. In the 1938 brood bluegills taken in 1939, 10.0 per cent had clear false annuli, formed in midsummer, that were in no way distinguishable from a true annulus. The false mark was in each case laid down outside of the first annulus (in the second summer of life). In the collections of 1940, 11.3 per cent of 329 fish of this brood (1938) showed a clear false annulus in the same position as those found in 1939, although in fish collected after May, when the 1940 annulus had formed, the false annulus lay between the first and second true annuli. In the collections of 1941, 5 of 35 fish (14.3 per cent) of the 1938 brood showed a clear false annulus in the same position. Thus, throughout the period of study, from 10.0 to 14.3 per cent of the 1938 brood bluegills collected each year showed a clear false annulus that formed during the summer of 1939 (outside the first true annulus). This false annulus was in no way distinguishable from the true annuli.

The scales of the 1938 brood bluegills were carefully checked for the presence of clear false annuli, other than those formed during the summer of 1939. Only 12 were found on fish collected in 1940 and later. These 12, located outside the second true annulus, appeared on the scales during the summer of 1940.

The 1939 and 1940 brood bluegills grew less rapidly than the 1938 brood and, while the exact identification of members of these broods is less certain than of members of the 1938 brood, monthly collections failed to show clear false annuli with any

degree of frequency. Table 8 gives the percentages of clear false annuli on the scales of 1939 and 1940 brood bluegills.

Clear false annuli were common on largemouth bass scales. About 6 per cent of the 1938 brood bass caught in 1939 showed a false annulus that might be confused with true annuli. In the 1940 collections of 1938 brood bass, 15.3 per cent of the fish showed a false annulus outside the first true annulus (false annuli formed in the summer of 1939). In the 1941 and 1942 collections of the same brood bass, false annuli were found on the scales of 6.9 per cent and 4.5 per cent, respectively. No distinct false annuli were found in the 1938 brood bass other than those that were formed during the summer of 1939, located between the first and second true annuli. No clear false annuli were present on the scales of either the 1940 or 1941 brood bass.

Other abnormalities associated with the scales of 1938 brood bass were found in this scale study. Some 1938 brood bass did not grow at all in 1939 and on the scales of these fish (three in number) the 1940 annulus replaced the annulus that should have appeared in the summer of 1939. Thus, these fish showed one less annulus than should have been present.

In nine other bass of the 1938 brood, the increase in length was very small in 1939. This small growth was reflected on the scales in an addition of only three or four circuli outside the 1939 annulus and these in only the anterior field of the scale. When the 1940 annulus formed, the interspace between it and the 1939 annulus consisted of the few circuli in the anterior field, and the two rings coincided in the lateral and posterior fields of the scale. Thus, a confusing partly double ring was formed, which probably would ordinarily be interpreted by a scale reader as a single

Table 8.—Percentage of clear false annuli observed on the scales of 1939 and 1940 brood bluegills in 1940, 1941, and 1942.

BROOD	1940			1941			1942		
	Number of Fish	Number with False Annuli	Per Cent with False Annuli	Number of Fish	Number with False Annuli	Per Cent with False Annuli	Number of Fish	Number with False Annuli	Per Cent with False Annuli
1939..	312	6	1.9	336	8	2.4	35	0	0.0
1940..	—	—	—	129	1	0.8	194	4	2.1

annulus. In the scales of two other fish of this brood, the 1939 and 1940 annuli were entirely distinct, but so close together as to throw suspicion on their validity. None of these abnormalities was accompanied by serious scale erosion and none was found on the scales of 1940 and 1941 brood bass.

Most of the annulus abnormalities given above—false annuli, skipped annuli, overlapping annuli, and close spacing of annuli—were associated with the 1938 broods of bass and bluegills, and most of the abnormalities were laid down on the scales during the growing season of 1939.

During this period (1939), the 1938 brood bluegills were growing rapidly and the 1938 brood bass very slowly (see preceding section on growth). Later broods of bluegills were subjected to more competition for food (growth was less rapid) and later broods of bass were subjected to less food competition. Therefore, I am inclined to follow the theory that scale abnormalities as related to annulus formation are more common in fish growing at an abnormally rapid rate, or at an abnormally slow rate, than in those subjected to moderate food competition, resulting in "average" growth.

Some information on the way false annuli may arise on the scales of "wild" fish was gained through experiments in feeding fishes confined in aquariums. Bruno von Limbach (unpublished experiments at Urbana) attempted to feed individual bluegills (one fish to an aquarium) on a heavy diet of earthworms (8 to 10 per cent of body weight per day). These fish fed well and gained rapidly for a few weeks. Then for no apparent reason they went "off feed" and refused to eat their quota of worms. In some individuals, this condition persisted for several months, during which they continued to eat only enough to maintain their body weight. In others, heavy feeding was resumed after a "rest" of 1 or several weeks. In the latter fish, the periods of self-imposed starvation, followed by a resumption of feeding, produced false annuli on the scales. It cannot, of course, be proved that "wild" fish go "off feed" when food is abundant, but the possibility is worth considering.

In other experiments in which bluegills were forced to alternate between periods

of feeding and starvation, clear false annuli were produced on the scales if the starvation period between two 4-week periods of feeding was 3 or more weeks in length. Lesser periods of starvation produced inconspicuous false rings. It is conceivable that, under conditions of crowding in natural or artificial waters, individual fish might go practically without food for as long as several weeks, later to be supplied with comparatively large quantities of food from a hatch of aquatic insects or a spawn of young fish.

Skipped annuli, partly double annuli, and close spacing of annuli are easily explained as resulting from degrees of starvation extending throughout an entire growing season.

### Spawning and Young Fish

No nests of largemouth bass were observed in Fork Lake during the period covered by this report. At the time of the dam failure, after all the water had drained from the pond basin, several craters were noted that may have been made by nesting bass in the spring of 1942. The nests of bluegills could be observed at almost any time during any summer and were most numerous in shallow water along the north shore of the pond near the spillway and on a submerged dome of earth at the east end between the forks. Nest-guarding males were nearly always present in these areas, where the nests of 5 to 10 inches in diameter were only a few inches apart, but more males were counted at the onset of the spawning season in May or early June than at any other period. Nesting males were least numerous on the spawning grounds from mid-June until the latter part of July. Later, the number of nest-guarding males increased.

In 1939, young bluegills were scarce, although bluegill nests were in use throughout the summer. The 1938 brood bass (stocked as fry) were then 6 to 10 inches long and on a number of occasions were observed to enter bluegill nests and feed upon bluegill fry in the yolk sac stage. No young bass were observed in 1939.

On May 27, 1940, 15 bluegill nests were counted in the spillway spawning grounds, fig. 10, and several thousand fry were schooling near these nests. The bass

fry stocked in 1938 became sexually mature in 1940 and, on June 3 of that year, 11 schools of fry were counted. Throughout the summer both young bluegills and young

20, five large schools of bass fry were counted, each containing several thousand fish. On July 19, schools of small fish—both bass and bluegills—were everywhere

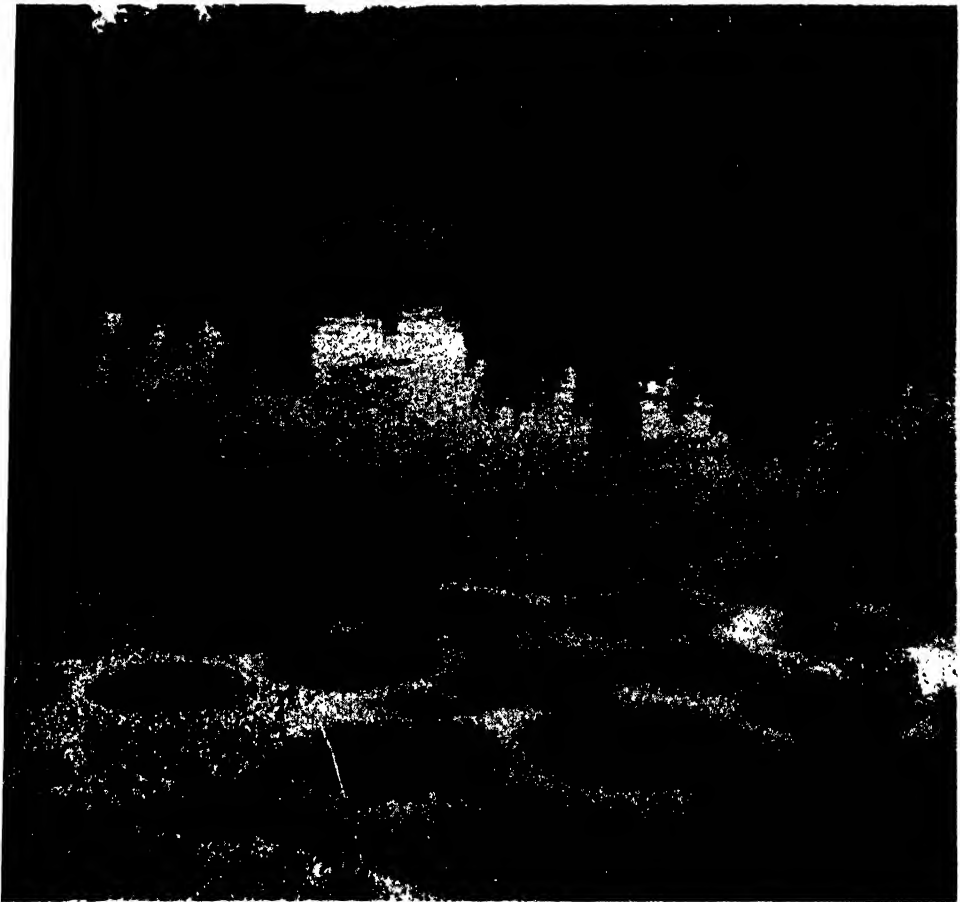


Fig. 10.—A group of bluegill nests near the spillway of Fork Lake. These nests were exposed by low water levels during August, 1940.

bass could be seen amidst the submerged vegetation.

The 1940 broods of bass and bluegills made poor growth in their first year, and many small bluegills were in evidence in the early spring of 1941. When nets were lifted on March 22, 1941, "showers" of small bluegills "rained" through the meshes and fell back into the pond. On April 15, 76 small bluegills were trapped, as a net was lifted, by a mat of *Spirogyra*. These fish averaged 1.48 inches long; the largest were 2.0 inches.

Nineteen bluegill nests containing eggs were seen on May 6, 1941, and, on May

along the edge of the pond in the fine-leaved potamogeton. When nests were raised on September 24, small bluegills and bass dropped through the meshes; most of the bass were less than 3 inches long and the bluegills less than 2 inches. Their numbers seemed scarcely less than in July, although all rooted submerged vegetation had disappeared in early August.

In 1942, the spawning season was unusually late, due to a cold, wet spring, and neither young bass nor young bluegills were seen as late as May 26. The first schools of bass were observed on June 2;

on this date 17 bluegill nests were found to contain eggs, but no bluegill fry were then in evidence. Throughout June the young of both species were again very numerous.

Each year of the Fork Lake study, with the exception of 1938 and 1939 when no mature bass were present, large numbers of young bass and bluegills were to be found in the pond. A minnow seine haul along the shore any time after June would have taken large numbers of both species.

Swingle (1945) recommended minnow seining in ponds as a method of testing the "balance" of a bass-bluegill population. The presence of the young of both species in such seine hauls was said to indicate that the fish population of the pond was in "balance" and the pond should produce good fishing. While the adult bass and bluegills in Fork Lake produced a successful spawn each year (1940-1942), this spawn production bore little relationship to the annual fish yield, average sizes of adult fish in the pond, or the catch of fish per man-hour.

It indicated, however, that the adult population of fish was not crowded to the extent that reproduction in either species was curtailed.

### Sexual Cycle

In the process of determining by dissection the sex of largemouth bass and bluegills from Fork Lake, it was noted that changes in the appearance of the ovaries and testes occurred that could be readily identified. In immature fish of both species, the sex was easily told, although the sex organs were often very small. In these fish, the ovaries were spindle shaped and granular, while the testes were almost threadlike. In late fall and early spring the gonads of the larger adult fish resembled those of the smaller immature fish, except that they were larger. As the spring advanced, the gonads of mature fish began to swell and change in shape and color, until in May these organs reached a maximum size, and soon after the reproductive products were ready for deposition. At this stage the ripe males would give off milt when gently pressed in the lower abdomen and females would pass eggs that were translucent, yellow, and sticky. After the spawning period, the

ovaries and testes appeared smaller and flabby, and pink or red with blood. In the fall the gonads again would assume an immature appearance.

In order to identify these changes with time in both species, a brief description of the stages was formulated. The classification given below was published in a previous Fork Lake report (Bennett, Thompson, & Parr 1940):

*Immature.* Testes slender, translucent cords; ovaries small, translucent, and grayish pink.

*Poorly developed.* Testes slightly enlarged, opaque, and white; ovaries somewhat enlarged, opaque, pale yellow, and developing eggs with a granular appearance.

*Enlarged.* Testes greatly enlarged, flattened, with wavy edges, opaque, and white; ovaries greatly enlarged, oval with large, distinct, solid, opaque, yellow eggs.

*Spawning condition.* Testes as above, but giving off milt when gently pressed; ovaries as above, but turgid, giving off eggs when gently pressed. Eggs semiliquid, translucent, yellow, and sticky.

*Partly spent.* Testes (after May) same as next above but less swollen; ovaries smaller, but very similar to conditions described as enlarged.

*Completely spent.* Testes small and pinkish; ovaries flabby at first, contracted later, pinkish, with granular appearance.

The divisions of this classification, while intergrading from one to another, were distinct enough for practical use. However, it was unknown what these stages represented microscopically and whether the classification was valid on a histological basis.

In order to determine the validity of the above classification and to answer other questions associated with reproduction in Fork Lake bass and bluegills, a histological study was begun in 1940 by Dr. Marian F. James (1946). From March, 1940, until July, 1942, gonads of 742 bluegills and 218 bass were removed from Fork Lake fish (samples every month except December, January, and February) and turned over to Dr. James for study. Supplementary gonads from bass of known ages were obtained from Ridge Lake near Charleston in east-central Illinois and from Lake Glendale near Robbs in southern Illinois.

A histological study of these gonads shows a well-founded basis for the macroscopic classification in both bass and bluegills. None of the larger 1-year-old bass from Fork Lake or Lake Glendale was sexually mature, and, although a few of the larger male bass that were hatched in Ridge Lake in May, 1941, developed small numbers of sperms in May, 1942, none of the female bass produced mature eggs. Many of these yearling bass were more than 10 inches in length and weighed 0.5 to 0.6 pound.

The larger and medium-sized 1-year-old bluegills from Fork Lake produced mature eggs or sperms, but those less than 2 inches long collected during the spawning season contained only small oocytes, indicating that they were sexually immature.

The time schedule of the sexual cycle of bluegills in 1940 was essentially the same as in 1939. Gonads of about 90 per cent of the bluegills examined were "poorly developed" in the period March 14-25; some were classified thus as late as August 19-22. "Enlarged" gonads were collected from April 12 to July 23; the higher percentages were in April, May, and June. Gonads in "spawning condition" first appeared May 20 and were present in the August 19-22 collections but not later. "Partly spent" testes first appeared June 13-19, and "partly spent" ovaries, July 17-23; no partly spent ovaries or testes appeared after September. Four per cent of the testes were "completely spent" June 13-19; only 58 per cent of the testes and 80 per cent of the ovaries were completely spent September 17-24. Gonads of all bluegills collected during the latter part of October and early November were completely spent and were in advanced reorganization stages (spermatogonia and small oocytes). Each year during the reorganization period, which followed after the completion of spawning, the spermatogonial cells and oocytes that became the spermatozoa and eggs for the next season were differentiated.

The timing of the sexual cycle in bass was a little in advance of that of bluegills. In the March 14-20 collecting period, 100 per cent of the gonads of 2-year-old bass were in the "enlarged" stage. In the May 6-26 collections, 27 per cent of the testes

were in "spawning condition," and 73 per cent were "partly spent," while 67 per cent of the ovaries were "enlarged," 25 per cent in "spawning condition," and 8 per cent "partly spent." No sexually mature bass were taken in June or July, but those taken in August or later contained reorganized gonads.

These studies indicate an intermittent spawning season for bluegills, in 1940 beginning the latter part of May and lasting through September. The bass spawning season was confined to May, beginning probably a little earlier than that of the bluegills. Field observers often recorded schools of young bass in Fork Lake by the time the bluegills were guarding eggs. In both species the males appeared to come into spawning condition a little before the females.

The histological study of James (1946) offers conclusive evidence that in Illinois bluegills mature at 1 year and bass at 2 years; some of the larger bass males produced a few sperms as yearlings. In the South, according to Swingle & Smith (1943), bluegills may reproduce at 4 months under unusually favorable conditions, but normally not until 1 year of age; bass commonly reproduce at 10 to 12 months unless stunted. These differences in the ages at which the two species reach sexual maturity in the North and in the South must be considered in stocking new ponds with bass and bluegill fry.

### Foods

Stomachs for food analysis were collected from Fork Lake bass and bluegills during 1939, 1940, and 1941. In 1941, the collections of bluegill stomachs were discontinued after May, but those of bass were continued throughout that season. The numbers of fish stomachs containing food taken through the months of collecting during these years were as follows: bluegills, 671 in 1939, 504 in 1940, 108 in March, April, and May, 1941; bass, 299 in 1939, 175 in 1940, 121 in 1941. As the stomachs were removed from the fish, each stomach was given an accession number and preserved in alcohol. Corresponding accession numbers on the scale envelopes made it possible to relate the stomachs to fish of known ages, lengths, and weights. Methods of determining

volume of stomach contents were those described in a previous Fork Lake report (Bennett, Thompson, & Parr 1940).

Although, in the years of this study the most pronounced change in the pond environment was caused by the gradual spread of *Potamogeton foliosus*, other less obvious changes may have affected the relative abundance of fish foods during the period of this study. No quantitative samples of aquatic invertebrates were made, and therefore changes in abundance of these animals were unrecorded except as indicated by field observations and stomach analyses.

Fluctuations in the numerical abundance in individual broods of bass and bluegills in Fork Lake probably affected the degree of food competition at various times during the  $3\frac{1}{2}$  years of study. The degree of competition for a "staple" food often determines whether an individual fish is able to select this in preference to some less satisfactory substitute. Two species of fish that compete but little for food in a favorable aquatic environment may, under crowded conditions, be forced to change their normal feeding habits and become highly competitive.

In 1938, after the pond was restocked with adult bluegills and bass fry, there was apparently little competition for food, as indicated by the growth of the stocked fish and the 1938 spawn of the bluegills.

It is likely that in March, April, and May of 1939 some of the smaller bluegills of the 1938 brood were still available for bass food, although bass stomachs collected in March did not contain any fish (Bennett, Thompson, & Parr 1940). Small bluegills were observed in the fall of 1938. Also, the increase from March to April, 1939, in the average lengths of 1938 brood bluegills collected, fig. 7, hardly can be explained as growth, because of low water temperatures at that period; rather this length increase in the collections suggests the elimination of the smaller individuals of the brood. In March, bass stomach contents consisted of 80 per cent water boatmen and back swimmers, 4 per cent aquatic beetle larvae, 15 per cent terrestrial insects, and 1 per cent insect fragments. In April, fish and crayfish made up a total of 37 per cent of the diet, Entomostraca—largely *Daphnia*—25 per cent, and water boatmen, back swimmers, aqua-

tic beetle larvae, and insect fragments the remaining 38 per cent. In May, fish and crayfish constituted 18.2 per cent of the diet. Other items, in addition to a trace of snails and coarse aquatic plants, consisted of insects, of which more than 25 per cent were adults—mostly dragonflies, damselflies, and midges. The extensive use of insects during this period indicates a scarcity of fish and crayfish of sizes that could be handled by 6-inch bass.

During the spring period of 1939, the bluegills of the original stock and the 1938 brood fed heavily on Cladocera, midge larvae, and snails; other aquatic insects were somewhat less important in the diet. Competition between bass and bluegills for any single group of insects was not obvious, but bass made wide use of the varieties of insects available. The nest robbing activities of bass on the bluegill spawning ground, mentioned previously, indicate the extent of the shortage of bass foods. In the collections of July, 1939, very small bluegills made up 51.4 per cent of the bass diet, but the figure dropped to less than 30 per cent in August and September and less than 10 per cent in October. Both bass and bluegills depended upon aquatic insects (mostly larval) during the latter part of the 1939 collecting season—feeding most heavily on Diptera larvae and water boatmen.

In 1939 the competition for insects between these two species of fish had no appreciable effect upon the growth rate of either the original or 1938 brood bluegills, fig. 7. Cladocera and midge larvae were more or less staple foods for the small-mouthed bluegills, but apparently Cladocera and aquatic insects were not conducive to rapid growth in bass.

In 1940, when aquatic vegetation began to appear in Fork Lake in abundance, stomach collections taken from March through June were largely from bass and bluegills of the 1938 broods, table 9. In March and April, both species fed largely on midge larvae, and the quantity of fish and crayfish in bass stomachs was insignificant. In May only one bass stomach was obtained and it contained 95 per cent crayfish. Contents of the bluegill stomachs collected in May consisted of *Daphnia* (50 per cent of the total), insects, and a few miscellaneous items; Diptera larvae constituted nearly 21 per cent of the total.



Table 9.—Results of stomach analyses of bass and bluegills taken from Fork Lake in 1940. In the columns designating types of food, figures not in parentheses represent percentages of total weight of stomach contents; figures in parentheses represent frequencies of occurrence on the basis of 100 stomachs.

MONTH AND GROUP OF FISH	NUMBER OF STOMACHS		TOTAL FOOD, GRAMS	DIPTERA		EPHEMERIDA		TRICHOPTERA LARVAE	DAMSELFLIES	
	Empty	With Food		Larvae	Adults	Nymphs	Adults		Nymphs	Adults
<i>March</i>										
1938 Bass.....	1	52	45.254	57.8 (100)	—	1.8 (27)	—	—	3.2 (40)	—
1938 Bluegills.....	0	10	8.500	95.8 (100)	—	0.2 (10)	—	—	1.4 (40)	—
<i>April</i>										
1938 Bass.....	3	40	35.370	71.9 (100)	0.4 (5)	—	—	—	1.4 (18)	—
1938 Bluegills.....	11	79	35.758	43.6 (89)	—	0.6 (6)	—	—	1.0 (8)	—
<i>May</i>										
1938 Bass.....	1	1	1.500	—	—	—	—	—	—	—
1938 Bluegills.....	2	83	27.658	20.8 (61)	—	1.3 (8)	—	0.3 (4)	—	—
<i>June</i>										
1938 Bass.....	0	11	11.432	—	—	—	—	0.5 (9)	19.1 (46)	—
1938 Bluegills.....	0	7	1.842	61.5 (71)	—	—	—	6.3 (43)	—	—
<i>July</i>										
1938 Bass.....	0	1	0.750	35.0 (100)	—	—	—	—	35.0 (100)	—
1938 Bluegills.....	0	5	2.015	16.6 (60)	—	—	—	2.5 (40)	—	—
1939 Bluegills.....	0	29	10.867	46.6 (83)	—	0.6 (7)	—	5.3 (41)	2.7 (24)	—
<i>August</i>										
1938 Bass.....	5	34	13.738	0.6 (6)	—	—	—	—	1.8 (6)	—
1938 Bluegills.....	1	7	3.330	30.2 (7)	—	1.8 (14)	—	1.5 (14)	2.3 (14)	—
1939 Bluegills.....	1	45	17.140	32.5 (76)	—	0.3 (4)	—	5.6 (36)	1.2 (13)	—
<i>October</i>										
1938 Bass.....	1	19	10.741	tr. (11)	—	—	—	—	0.5 (5)	—
1938 Bluegills.....	1	23	9.239	26.2 (74)	—	—	—	—	2.8 (13)	—
1939 Bluegills.....	9	110	35.849	25.6 (69)	—	1.0 (13)	—	1.2 (16)	7.5 (31)	—
<i>November</i>										
1938 Bass.....	2	9	8.716	—	—	—	—	—	3.9 (11)	—
1940 Bass.....	1	7	0.973	tr. (14)	—	—	—	—	16.4 (29)	—
1938 Bluegills.....	0	3	2.200	32.5 (100)	—	8.6 (67)	—	3.5 (67)	3.6 (33)	—
1939 Bluegills.....	2	90	28.319	45.3 (32)	—	4.5 (28)	—	2.6 (22)	9.2 (43)	—

Table 9 (continued)

MONTH AND GROUP OF FISH	ENTOMOSTRACA			MOLLUSCA		COARSE AQUATIC PLANTS	ALGAE	WATER MITES	SAND AND SCALES	MISCEL- LANEOUS
	Daphnia	Cyclops	Cypris	Snails	Sphaeriids					
<i>March</i>										
1938 Bass.....	—	—	tr. (4)	—	—	tr. (2)	—	—	—	—
1938 Bluegills.....	2.5 (90)	—	—	—	—	—	—	—	—	—
<i>April</i>										
1938 Bass.....	tr. (5)	—	tr. (3)	—	—	—	—	—	—	—
1938 Bluegills.....	28.7 (75)	tr. (1)	tr. (3)	0.2 (3)	—	—	—	—	—	—
<i>May</i>										
1938 Bass.....	—	—	—	—	—	1.5 (8)	tr. (1)	—	—	1.4 (16)
1938 Bluegills.....	50.0 (73)	—	—	2.2 (16)	—	—	—	—	—	—
<i>June</i>										
1938 Bass.....	—	—	—	—	—	1.0 (18)	—	—	—	0.5 (18)
1938 Bluegills.....	—	—	—	3.1 (29)	—	1.3 (29)	1.0 (14)	—	—	2.7 (43)
<i>July</i>										
1938 Bass.....	—	—	—	—	—	—	—	—	—	—
1938 Bluegills.....	—	0.3 (40)	—	10.7 (20)	—	—	—	—	—	2.5 (40)
1939 Bluegills.....	—	1.4 (38)	—	4.3 (34)	—	0.4 (14)	1.8 (14)	tr. (3)	—	tr. (7)
<i>August</i>										
1938 Bass.....	—	tr. (3)	—	6.3 (24)	—	1.4 (12)	0.6 (3)	—	—	tr. (3)
1938 Bluegills.....	—	—	—	25.4 (86)	—	0.5 (14)	7.3 (29)	—	—	0.3 (14)
1939 Bluegills.....	—	2.6 (31)	—	9.2 (40)	—	8.3 (24)	3.2 (22)	—	—	6.5 (29)
<i>October</i>										
1938 Bass.....	2.6 (5)	0.5 (5)	—	0.9 (5)	—	—	2.6 (16)	—	—	tr. (5)
1938 Bluegills.....	8.1 (30)	3.0 (17)	3.7 (30)	24.7 (65)	—	2.5 (22)	7.4 (43)	—	—	1.0 (30)
1939 Bluegills.....	17.5 (53)	5.3 (54)	0.9 (18)	8.5 (37)	—	2.0 (14)	9.4 (44)	—	—	0.5 (17)
<i>November</i>										
1938 Bass.....	—	—	—	—	—	—	0.7 (22)	—	—	—
1940 Bass.....	tr. (14)	—	—	—	—	—	—	—	—	—
1938 Bluegills.....	35.0 (100)	2.3 (33)	6.4 (33)	2.3 (33)	—	—	1.4 (33)	—	—	—
1939 Bluegills.....	28.1 (96)	2.4 (57)	2.4 (29)	0.9 (10)	—	—	2.0 (22)	—	—	tr. (2)

Table 9 (concluded)

MONTH AND GROUP OF FISH	DRAGONFLIES		WATER BOATMEN	WATER STRIDERS	AQUATIC BEETLES		TERRESTRIAL INSECTS AND WORMS	INSECT FRAGMENTS	FISH	CRAYFISH
	Nymphs	Adults			Larvae	Adults				
<i>March</i>										
1938 Bass.....	33.0 (62)	—	2.8 (21)	—	—	—	0.5 (2)	—	—	0.9 (2)
1938 Bluegills.....	—	—	—	—	—	—	—	—	—	—
<i>April</i>										
1938 Bass.....	4.0 (13)	—	5.1 (28)	tr. (3)	—	0.5 (3)	2.5 (20)	7.9 (35)	3.7 (5)	2.5 (3)
1938 Bluegills.....	—	—	—	—	tr. (1)	tr. (1)	—	25.6 (53)	—	—
<i>May</i>										
1938 Bass.....	—	—	—	5.0 (100)	—	—	—	—	—	95.0 (100)
1938 Bluegills.....	—	—	tr. (4)	—	tr. (1)	—	tr. (1)	21.9 (45)	—	—
<i>June</i>										
1938 Bass.....	21.7 (36)	—	10.2 (18)	2.5 (64)	—	—	—	18.9 (27)	—	25.6 (36)
1938 Bluegills.....	—	—	—	—	—	—	—	24.2 (43)	—	—
<i>July</i>										
1938 Bass.....	—	—	—	—	—	—	—	30.0 (100)	—	—
1938 Bluegills.....	—	—	—	—	—	—	—	67.5 (80)	—	—
1939 Bluegills.....	0.4 (7)	—	—	0.2 (3)	12.6 (24)	—	—	23.7 (69)	—	—
<i>August</i>										
1938 Bass.....	3.5 (9)	—	—	1.2 (3)	—	—	—	6.7 (9)	73.5 (85)	3.9 (6)
1938 Bluegills.....	6.0 (14)	—	—	—	—	—	—	24.8 (71)	—	—
1939 Bluegills.....	2.0 (2)	—	tr. (2)	tr. (2)	3.2 (22)	—	0.4 (2)	24.7 (73)	—	—
<i>October</i>										
1938 Bass.....	6.8 (11)	—	tr. (5)	—	—	—	—	3.4 (11)	81.2 (90)	—
1938 Bluegills.....	4.3 (4)	—	—	tr. (4)	—	—	—	16.1 (57)	—	—
1939 Bluegills.....	1.2 (5)	—	tr. (5)	—	0.4 (5)	—	1.1 (8)	17.7 (45)	—	—
<i>November</i>										
1938 Bass.....	—	—	—	—	—	—	—	3.2 (11)	88.3 (100)	3.9 (11)
1940 Bass.....	—	—	—	—	—	—	—	14.3 (14)	69.0 (71)	—
1938 Bluegills.....	—	—	—	—	—	—	—	4.5 (33)	—	—
1939 Bluegills.....	tr. (1)	—	—	—	0.9 (10)	—	—	0.5 (3)	1.2 (1)	—

The large spawn of both bass and bluegills in late May and early June, 1940, probably improved the food situation for bass, although the heavy stand of aquatic vegetation offered excellent protection for young fish. The growth curve for 1938 brood bass indicates that most of the length increase occurred after June, fig. 6. In contrast to the spring diet of bass, which was largely insects, the late summer and fall diet consisted of more than 70 per cent fish, many of which were young bass. Other items of importance were crayfish, snails, and miscellaneous aquatic insect larvae. Diptera larvae were commonly found in the stomachs of bluegills of all sizes throughout 1940, and entomostracans were important from March through May and in October and November. Except that smaller numbers of *Corixa* and *Notonecta* were taken in 1940 than in 1939, bluegill foods were essentially the same in the 2 years. The 1939 brood bluegills grew less rapidly in 1940 than the 1938 brood when of comparable age (during 1939), fig. 7.

At the beginning of 1941, Fork Lake contained two broods of bass (1938 and 1940) and three broods of bluegills (1938, 1939, and 1940), as well as the few remaining original adult bluegills. No bass stomachs were taken in March, but, in April, 9 of the total of 15 original stock bass collected (1938 brood) contained fish and 7 contained crayfish, table 10. These two items together made up 54 per cent of the weight of all food taken. Other important items were Diptera larvae, dragonfly nymphs, and miscellaneous insect fragments. As indicated previously, growth of the broods of bass was slow until the plant die-off in August. In August and September, after the rooted plants disappeared, stomach contents of bass of all broods (1938, 1940, and 1941) showed a smaller variety of foods and a higher percentage of fish than in any other 2-month period, and growth was very rapid. It is of some interest to note here that in August and September a few of the small 1941 brood bass ate small leopard frogs and their metamorphosing tadpoles. Although bullfrog tadpoles were always numerous in Fork Lake, they were found rarely in bass stomachs.

In 1941, as in previous years, bluegills fed largely on Diptera larvae, damselfly

nymphs, dragonfly nymphs, *Daphnia*, and snails.

Table 11 represents a summary of food items for all years shown as percentages of the total weights of all foods taken. Any figure of less than 4 per cent has been omitted. This table also lists the average lengths of the broods of bass and bluegills collected at the beginning and end of each collecting season, so that a comparison may be made between length increment and kind of food consumed.

Although Diptera larvae appeared to be very important in the diet of bluegills, as did Entomostraca and snails, no difference in growth of 1938 and 1939 brood bluegills can be shown to be associated with certain foods.

The importance of specific types of food in the diet of bass is obvious. In the 1938 brood bass, the only brood of this species present throughout all years of this study, there seemed to be a direct relationship between rate of growth and the percentage by weight of fish and crayfish in the diet. In 1939, collections of bass indicated that this brood increased 1 inch in length and made a relatively small weight increase; the percentages of fish and crayfish in the diet were 13.8 and 9.2, respectively, table 11. In 1940, the average length of 1938 brood bass in the collections increased from 7 to 10 inches and the weight more than doubled; the percentages of fish and crayfish in the diet were 21.2 and 13.0, respectively. In 1941, in spite of the fact that bass in the collections averaged 10 inches and about 0.5 pound in weight at the beginning of the collecting season, they increased an average of 3 inches in length and nearly tripled their weight in that year; the percentages of fish and crayfish in their diet were 34.5 and 34.4, respectively. In both the 1940 and the 1941 broods of bass, growth was rapid on a diet of fish, small frogs, and tadpoles.

The more common forms of Diptera larvae found in bass and bluegill stomachs were the Chironomidae (midges)—*Chironomus* and *Tanytus*; Chaoboridae—*Chaoborus*; Ceratopogonidae (biting midges)—*Palpomyia*, *Bezzia*, and *Probezzia*; Simuliidae (black flies)—*Simulium*; Stratiomyidae (soldier flies)—*Stratiomys*, *Odontomyia*; and Culicidae (mosquitoes)—*Culex*. No attempt was made to identify families or genera of Mayfly nymphs. The

Table 10.—Results of stomach analyses of bass and bluegills taken from Fork Lake in 1941. In the columns designating types of food, figures not in parentheses represent percentages of total weight of stomach contents; figures in parentheses represent frequencies of occurrence on the basis of 100 stomachs. Analyses of bluegill stomachs were discontinued after May.

MONTH AND GROUP OF FISH	NUMBER OF STOMACHS		TOTAL FOOD, GRAMS	DIPTERA		EPHEMERIDA		TRICHOPTERA LARVAE	DAMSELFLIES	
	Empty	With Food		Larvae	Adults	Nymphs	Adults		Nymphs	Adults
<i>March</i>										
1938 Bluegills.....	1	7	4.557	76.8 (86)	—	—	—	—	9.5 (29)	—
1939 Bluegills.....	1	38	14.520	60.2 (89)	—	tr. (3)	—	—	3.1 (24)	—
<i>April</i>										
1938 Bass.....	2	15	18.206	11.4 (47)	—	2.1 (20)	—	—	0.8 (13)	—
1938 Bluegills.....	0	3	2.200	62.7 (100)	—	0.9 (33)	—	—	—	—
1939 Bluegills.....	5	21	7.093	24.0 (43)	—	—	—	—	15.7 (19)	—
<i>May</i>										
1938 Bass.....	3	19	20.493	1.2 (11)	—	tr. (5)	—	—	9.4 (16)	4.9 (11)
1938 Bluegills.....	1	2	0.071	4.2 (50)	—	—	—	—	—	—
1939 Bluegills.....	0	37	20.692	43.4 (54)	tr. (3)	—	—	0.8 (8)	0.6 (19)	tr. (5)
<i>June</i>										
1938 Bass.....	1	2	2.000	—	—	—	—	—	2.5 (50)	—
1940 Bass.....	0	1	1.200	—	—	—	—	—	—	—
<i>July</i>										
1940 Bass.....	1	4	1.835	1.3 (50)	—	—	—	—	0.5 (25)	—
1941 Bass.....	0	2	0.370	—	—	—	—	—	4.5 (50)	—
<i>August</i>										
1938 Bass.....	0	2	1.566	—	—	—	—	—	—	—
1940 Bass.....	3	6	6.500	—	—	—	—	—	—	—
1941 Bass.....	4	18	6.361	—	—	—	—	—	—	—
<i>September</i>										
1938 Bass.....	2	3	7.000	—	—	—	—	—	—	—
1940 Bass.....	0	3	4.250	—	—	—	—	—	—	—
1941 Bass.....	12	39	22.459	—	—	—	—	—	2.6 (3)	—
<i>October</i>										
1941 Bass.....	2	4	0.068	2.0 (25)	—	—	—	—	—	—
<i>November</i>										
1941 Bass.....	2	3	1.850	—	—	—	—	—	—	—

Table 10 (continued)

MONTH AND GROUP OF FISH	DRAGONFLIES		WATER BOATMEN	WATER STRIDERS	AQUATIC BEETLES		TERRESTRIAL INSECTS AND WORMS	INSECT FRAGMENTS	FISH	CRAWFISH
	Nymphs	Adults			Larvae	Adults				
<i>March</i>										
1938 Bluegills.....	—	—	0.6 (14)	—	—	—	—	—	—	—
1939 Bluegills.....	1.2 (8)	—	1.4 (13)	0.2 (3)	tr. (5)	tr. (3)	0.7 (3)	9.5 (39)	—	—
<i>April</i>										
1938 Bass.....	9.7 (20)	—	5.7 (27)	—	5.9 (7)	—	—	16.3 (53)	28.5 (60)	25.5 (47)
1938 Bluegills.....	0.9 (33)	—	—	—	—	—	—	—	—	—
1939 Bluegills.....	—	—	—	—	—	—	—	6.4 (10)	—	—
<i>May</i>										
1938 Bass.....	12.4 (21)	—	—	1.8 (11)	—	5.3 (5)	tr. (5)	5.9 (37)	25.9 (37)	17.0 (26)
1938 Bluegills.....	—	—	—	—	39.4 (100)	—	—	9.9 (50)	—	—
1939 Bluegills.....	0.4 (8)	—	tr. (5)	—	20.8 (76)	—	0.6 (22)	11.9 (41)	—	—
<i>June</i>										
1938 Bass.....	10.0 (50)	—	—	—	—	—	—	—	70.0 (100)	—
1940 Bass.....	—	—	—	—	—	—	—	—	100.0 (100)	—
<i>July</i>										
1940 Bass.....	—	—	—	—	tr. (25)	—	0.5 (25)	25.0 (25)	25.0 (25)	—
1941 Bass.....	—	—	—	—	—	—	—	10.0 (50)	45.0 (50)	—
<i>August</i>										
1938 Bass.....	—	—	—	—	—	—	—	50.0 (100)	50.0 (50)	—
1940 Bass.....	—	—	—	—	—	—	—	—	83.3 (83)	—
1941 Bass.....	—	—	—	—	—	—	—	13.9 (17)	56.1 (61)	—
<i>September</i>										
1938 Bass.....	—	—	—	—	—	—	—	—	100.0 (100)	—
1940 Bass.....	—	—	—	—	—	—	—	—	100.0 (100)	—
1941 Bass.....	—	—	—	—	—	—	—	26.7 (28)	57.9 (62)	—
<i>October</i>										
1941 Bass.....	—	—	—	—	—	25.0 (25)	—	25.0 (25)	—	—
<i>November</i>										
1941 Bass.....	—	—	—	—	—	—	25.0 (33)	8.3 (33)	65.0 (66)	—

Table 10 (concluded)

MONTH AND GROUP OF FISH	ENTOMOSTRACA			MOLLUSCA		COARSE AQUATIC PLANTS	ALGAE	WATER MITES	SAND AND SCALES	MISCEL- LANEOUS
	Daphnia	Cyclops	Cypris	Snails	Sphaeriids					
<i>March</i>										
1938 Bluegills	tr. (14)	—	—	11.7 (43)	—	—	0.3 (29)	—	0.2 (14)	0.7 (14)
1939 Bluegills	13.3 (53)	—	—	9.3 (34)	—	—	0.5 (24)	—	tr. (5)	tr. (5)
<i>April</i>										
1938 Bass	—	—	—	—	—	—	0.9 (40)	—	—	—
1938 Bluegills	26.8 (66)	—	—	6.4 (66)	—	—	2.3 (33)	—	—	—
1939 Bluegills	46.5 (95)	—	—	3.2 (19)	—	—	2.6 (33)	—	tr. (5)	1.5 (10)
<i>May</i>										
1938 Bass	—	—	—	0.5 (5)	—	2.6 (5)	2.1 (11)	—	1.1 (5)	—
1938 Bluegills	—	—	—	—	—	—	45.5 (50)	—	—	—
1939 Bluegills	8.5 (49)	—	—	3.4 (46)	tr. (3)	tr. (3)	6.9 (57)	—	1.3 (19)	tr. (11)
<i>June</i>										
1938 Bass	—	—	—	—	—	—	—	—	17.5 (50)	—
1940 Bass	—	—	—	—	—	—	—	—	—	—
<i>July</i>										
1940 Bass	—	—	—	—	—	22.5 (50)	25.0 (50)	—	—	—
1941 Bass	—	—	—	—	—	—	—	—	—	—
<i>August</i>										
1938 Bass	—	—	—	—	—	—	—	—	—	—
1940 Bass	—	—	—	—	—	—	—	—	—	—
1941 Bass	—	—	—	—	—	2.2 (6)	—	—	5.6 (6)	16.7 (17) 27.8 (28) <sup>1</sup>
<i>September</i>										
1938 Bass	—	—	—	—	—	—	—	—	—	—
1940 Bass	—	—	—	—	—	—	—	—	—	—
1941 Bass	—	—	—	—	—	tr. (3)	—	—	—	12.6 (13) <sup>1</sup>
<i>October</i>										
1941 Bass	48.0 (50)	—	—	—	—	—	—	—	—	—
<i>November</i>										
1941 Bass	—	—	—	—	—	—	—	—	—	—

<sup>1</sup> Frogs and tadpoles.

houses of caddis worms were largely those of *Oecetis inconspicua* (Walker), *Molanna*, *Oxyethira*, and *Orthotrichia*. The damselflies were largely of the genus *Enallagma*. Dragonfly nymphs were *Epicoridulia* and others; aquatic Hemiptera were *Corixa* and *Notonecta*. Water striders were *Gerris*. The beetle larvae were Dytiscidae (*Dytiscus*), Hydrophilidae (*Enochrus* and *Berosus*), and Haliplidae (*Haliphus* and *Peltodytes*). Terrestrial invertebrates were ants, moths, a wasp, terrestrial beetles, leafhoppers, ichneumonid wasps, March flies, bees, chalcid wasps, house flies, June beetles, grasshoppers, earthworms, and spiders.

Fish were, of course, largemouth bass and bluegills; crayfish were *Cambarus virilis* and *C. propinquus*.

Entomostraca were *Daphnia* and *Ceriodaphnia*, *Cyclops* and *Diaptomus*, as well as *Cypris*. Mollusks were both *Physa* and planorbis type snails and *Musculium*. Coarse plants were *Potamogeton foliosus* and *Anacharis canadensis* (Michaux).

Water mites were not identifiable. Items of infrequent occurrence included leopard frogs, *Rana pipiens* Schreber, and tadpoles of both leopard frogs and bullfrogs, *R. catesbeiana*, hairworms (*Gordius*), seeds, a millepede, slugs, stoneflies, and grass.

### Discussion

The investigation of Fork Lake was originally planned to study the effect of heavy cropping upon the combination of largemouth bass and bluegills in a small artificial lake or pond. The results obtained were influenced by the unexpected spread of *Potamogeton foliosus* in this pond, and a proposed final fish census was rendered impossible by a washout of the dam in 1942.

In 1938, at the time the pond was cleared of its old fish population and restocked with a known number of bass and bluegills, little careful experimental work had been done on fish stocking. The number of largemouth bass fry (1,440) placed in the pond proved to be too large; after making rapid growth in 1938, these fish practically stopped growing until their numbers had been considerably reduced by fishing. At the time of stocking it was believed that cannibalism among the

young bass and predation by the adult bluegills would result in the survival of fewer of these fish.

The decision on the number of bluegills to stock was based on the assumption that the adult bluegills would spawn in 1938 and furnish bluegill fry and fingerlings for bass food. It was believed that the adults themselves would add enough flesh in that season to give a harvestable crop of about 100 pounds of large bluegills in 1939, and yet leave adequate available food for rapid growth in the surviving bluegill spawn. Therefore, it was decided that a stocking of 200 to 250 sexually mature bluegills should be adequate, and 240 were stocked.

The number of bluegills stocked was more nearly correct for Fork Lake than was the number of bass. The original bluegill stock increased in weight to 0.35 or 0.40 pound each by 1939 and produced a large spawn, a part of which survived and grew rapidly to good sizes. These 1938 brood bluegills furnished most of the bluegill yield during 1939 and 1940.

Since 1938, Smith & Swingle (1943) have furnished valuable information on the survival of bass and bluegill fry stocked in new ponds in the South. The intensive cropping of Fork Lake with small-mesh wing nets did not deplete the bass or seriously reduce the number of bluegills, in spite of the fact that these nets caught 5.0-inch bass and 3.5-inch bluegills and that practically all fish trapped in nets were removed from the pond. Some growth compensation must have resulted from cropping during 1939 in the 1938 brood bluegills, and during 1939 and 1940 in the 1938 brood bass. These bass probably would have remained at about 6 to 8 inches had their numbers not been reduced. The fact that this small pond contained at least 66 bass of the 1938 brood after 3½ years of intensive net fishing suggests that this type of gear is inefficient in catching this species, or perhaps that bass learn by observation to avoid wing nets. The total yield of bass would have been much lower had no attempt been made to crop them by angling. Sportsmen often assume that the nets of commercial fishermen are to blame for an apparent scarcity of bass. The Fork Lake experiment seems to indicate that this assumption is unfounded.



Table 11.—Percentages of total weight of all food items in the stomachs of bass and bluegills taken each year from Fork Lake, 1939, 1940, 1941. Percentages of less than 4.0 have been omitted.

YEAR AND GROUP OF FISH	AVERAGE LENGTH, INCHES		DIPTERA LARVAE	DAMSELFLIES		DRAGONFLIES		WATER BOATMEN
	Beginning	End		Nymphs	Adults	Nymphs	Adults	
1939								
1938 Bass.....	6.0	7.0	9.9	—	10.2	4.6	4.0	21.3
Original bluegills.....	7.5	7.7	33.9	—	—	—	—	8.3
1938 Bluegills.....	3.5	6.5	31.2	—	—	—	—	—
1940								
1938 Bass.....	7.0	10.0	34.0	—	—	19.8	—	—
1938 Bluegills.....	6.5	7.4	38.8	—	—	—	—	—
1939 Bluegills.....	4.7 <sup>1</sup>	4.8	35.5	6.3	—	—	—	—
1940 Bass <sup>2</sup> .....	—	4.0	—	4.4	—	—	—	—
1941								
1938 Bass.....	10.0	13.0	—	—	—	11.9	—	—
1938 Bluegills <sup>3</sup> .....	7.6	7.8	71.7	6.3	—	—	—	—
1939 Bluegills <sup>3</sup> .....	4.8	6.3	45.9	—	4.0	—	—	—
1940 Bass.....	4.0	10.5	—	—	—	—	—	—
1941 Bass <sup>2</sup> .....	—	6.5	—	—	—	—	—	—

<sup>1</sup> June.

<sup>2</sup> Fall only.

<sup>3</sup> Spring months only.

Table 11 (concluded)

YEAR AND GROUP OF FISH	AQUATIC BEETLES		INSECT FRAGMENTS	FISH	CRAYFISH	CLADOCERA	SNAILS	COARSE AQUATIC PLANTS	ALGAE	MISCELLANEOUS
	Larvae	Adults								
1939										
1938 Bass.....	—	—	12.3	13.8	9.2	8.4	11.5	6.8	8.8	—
Original bluegills.....	—	—	7.1	—	—	29.7	9.2	—	—	—
1938 Bluegills.....	—	—	—	—	—	—	—	—	—	—
1940										
1938 Bass.....	—	—	—	21.2	13.0	28.5	4.5	—	—	—
1938 Bluegills.....	—	—	21.5	—	—	15.4	5.8	—	5.0	—
1939 Bluegills.....	—	—	14.4	—	—	—	—	—	—	—
1940 Bass <sup>1</sup> .....	—	—	—	95.2	—	—	—	—	—	—
1941										
1938 Bass.....	—	4.1	4.0	34.5	34.4	8.7	9.9	—	—	—
1938 Bluegills <sup>2</sup> .....	—	—	—	—	—	16.5	5.4	—	4.0	—
1939 Bluegills <sup>2</sup> .....	10.2	—	10.2	—	—	—	—	—	—	14.7 <sup>3</sup>
1940 Bass.....	—	—	—	79.1	—	—	—	—	—	17.1 <sup>3</sup>
1941 Bass <sup>1</sup> .....	—	—	5.5	75.3	—	—	—	—	—	—

<sup>1</sup> Fall only.<sup>2</sup> Spring months only.<sup>3</sup> Frogs and tadpoles.

The yield of fish decreased during the period of cropping. Theoretically, as fish are continually being removed from a body of water, and the fertility of the water is maintained at a nearly constant level, those fish that remain will have more available food per individual, and, because fish growth follows no definite pattern correlated with age, this increase in food for each individual fish will allow rapid growth to continue throughout the life span of each individual, or until it in turn is captured and removed. In spite of heavy cropping of bluegills, growth rate of the bluegills escaping the nets did not improve; in fact, the growth rate of this species decreased with each successive year. The decrease can be explained, in my opinion, only on the basis that the total food supply of the omnivorous bluegills in Fork Lake was reduced so rapidly from year to year by the spread of potamogeton that constant cropping did not increase the per capita food supply.

The pond was thermally stratified throughout each summer with only a trace of oxygen below 4 feet (Bennett, Thompson, & Parr 1940) so that throughout much of the fish growing season only bottom forms such as *Chaoborus* were found in the deeper open waters of the pond. Such bottom organisms as were able to live among the roots of the aquatic plants may have been largely unavailable to larger fishes when the plant growths were rank. Very small fish were nearly always visible within the protective borders of the plant growths. These fish were relatively safe from the larger fishes that would use them for food, but their poor growth rate indicated that their food supply within the plant mats was limited. It may be assumed that the dissolved oxygen in the water among the rank plant growths fluctuated from supersaturation in the day time, when the plants were able to carry on photosynthesis, to absence of oxygen or very low oxygen tension in the period preceding dawn. If the assumption is true, the small fishes may have moved out to the edges of the vegetation, but zooplankton that required oxygen and had only weak powers of locomotion may have suffocated within the plant mats. Thus, the dense mats of vegetation may have acted as traps to many forms of the Entomostraca and caused reduction of these forms in the

pond. Cladocera made up a large percentage of the stomach contents of bluegills in spring and fall, before the rooted vegetation had become dense and after it had died down. Maximum numbers of Entomostraca in large deep lakes are found usually in spring and fall, but according to Pennak (1946), the peak numbers of Entomostraca do not occur with any regularity in smaller lakes and ponds.

It must be considered that the rooted plants were competing with algae for the dissolved plant nutrients in the water. These nutrients were bound up within the bodies of the rooted plants during much of the growing season of fish and, as these plants were not a source of food for fish or many of the fish food organisms, they may have reduced the carrying capacity of the pond for fish.

The removal of a large poundage of fish from Fork Lake each year might be expected to reduce the productivity of the pond, if the water entering from the drainage basin were relatively sterile. However, the watershed of Fork Lake is good corn land, pasture, and timber.

The above are hypotheses that may explain in part the reduced yield of fish from Fork Lake and the absence of growth compensation in bluegills, despite heavy cropping.

The study of foods ingested by large-mouth bass, table 11, demonstrates that fish and crayfish are essential for rapid growth in this important fish species.

During the die-off of vegetation and the "bloom" period in 1941, the bass made excellent growth because the vegetation-inhabiting small fish suddenly were made available for food at a time when the water was warm enough for rapid assimilation and growth. It must be assumed, because of lack of a similar increase in growth rate of bluegills, that the death of the plants released no comparable supply of food for bluegills and that no large source of invertebrate food developed as a result of the algal "bloom." Failure of the invertebrate population of Fork Lake to expand as a result of the algal "bloom" may have been due to the specific kind of algae that developed, or it may have been that the season or physical conditions in the pond were not right for an eruption of Entomostraca or a sizable increase of insect larvae.

### Summary

1. The fish in Fork Lake, a pond of 1.38 acres near Mount Zion, Illinois, were poisoned and the pond restocked with 1,440 largemouth bass fry and 240 adult bluegills in June, 1938.

2. Beginning in March, 1939, the fish were cropped with 1-inch-mesh wing nets and with hook and line; nets were fished, March through November, in 1939, 1940, 1941, and, March through June, in 1942; with few exceptions, fish caught were removed from the pond. The yield was 223.0 pounds in 1939, 200.0 pounds in 1940, 130.0 pounds in 1941, and 60.5 pounds in 1942 (4 months). During the years in which cropping continued through November, the bass yield remained at about 50 to 60 pounds.

3. On July 8, 1942, the dam was washed out by a 4-inch rain. The part of the fish population trapped in a net across the break and in the pond basin amounted to 169 pounds of bass and 92 pounds of bluegills or a total of 261 pounds. Sixty-six of the original bass stocked in the pond as fry in 1938 were taken in the washout.

4. The most noticeable change in the pond habitat during the years of cropping was an increase in the abundance of fine-leaved pondweed, *Potamogeton foliosus*. In 1939, plants of this species reduced the area of open water to 1.25 acres, in 1940 to 0.95 acre, and in 1941 to 0.64 acre. The progressive annual decrease in fish yield seemed to show a positive relationship to the progressive decrease in the area of open water.

5. Bass growth was slow in 1939 and in the March-June period of 1940 and 1941, fig. 6. Some improvement occurred in the July-October period of 1940 after both bass and bluegill young were available for food. In August, 1941, a sudden die-off of *Potamogeton foliosus* occurred and was followed by a "bloom" of algae, *Aphanizomenon flos-aquae*. With the disappearance of the protective mats of *potamogeton*, the small fish became available for food, and the bass began to grow at a very rapid rate. Despite intensive cropping, each successive brood of bluegills spawned in the pond grew less rapidly than the preceding brood; bluegills showed no improvement in growth rate as a result of the plant die-off of August, 1941.

6. Improvement in condition (relative plumpness) of bass paralleled periods of rapid growth; in bluegills a regular yearly cycle of condition was shown by all broods, with a high condition in spring and a low in November. No improvement in condition of bluegills followed the plant die-off of 1941.

7. Scales of the 1938 broods of both bass and bluegills showed abnormalities such as false annuli, skipped annuli, and close spacing of annuli; nearly all of these abnormalities appeared during the growing season of 1939. Scales of later broods presented almost no false rings or unusual spacing of annuli. It is believed that the abnormalities of 1939 were associated with very rapid growth in the bluegills and with very slow growth in the bass.

8. Broods of young bluegills were produced in the pond each year. The bass fry stocked in 1938 first became sexually mature in 1940 and large broods of bass were produced in that year and the years following.

9. A histological study of the sexual cycle of bass and bluegills made by Dr. Marian F. James (1946) indicated a short spawning season for bass (May) and a longer season for bluegills (May through September). Bluegills became sexually mature at an age of 12 months unless badly stunted; although several of the larger male bass produced a few sperms at 1 year, no females produced mature eggs until 2 years of age.

10. Stomach analyses of Fork Lake bass and bluegills indicated that, when fish and crayfish were scarce, bass competed with the bluegills for insects and Entomostraca and made poor growth. The rate of growth in bass was apparently correlated with the percentages of fish and crayfish in the diet. Bluegills of all sizes fed largely on Diptera larvae, Entomostraca, and snails; no correlation was found between growth rate and the ingestion of certain kinds of food in bluegills.

11. Bluegills in Fork Lake grew at a decreasing rate throughout the years of cropping, and the yearly yield in pounds of these fish was progressively smaller each year. Together, these phenomena indicate a diminishing supply of food in the pond for these fish. If the food supply had remained constant in total volume from year to year, the removal each year of a large

crop of bluegills from 3.5 to 9.0 inches in length would have increased the food supply for those fish remaining and resulted in an accelerated growth rate. The mats of aquatic vegetation probably greatly reduced the production of invertebrate fish foods in the pond shallows and thereby more than nullified the effect of cropping.

### LITERATURE CITED

- Bennett, George W., David H. Thompson, and Sam A. Parr  
1940. Lake Management Reports. 4. A second year of fisheries investigations at Fork Lake, 1939. Ill. Nat. Hist. Surv. Biol. Notes 14. 24 pp., 10 figs., 4 pls.
- Brown, C. J. D., and Robert C. Ball  
1943. An experiment in the use of derris root (rotenone) on the fish and fish-food organisms of Third Sister Lake. Am. Fish. Soc. Trans. 72(1942):267-84. 1 fig.
- Cooper, Gerald P.  
1937. Food habits, rate of growth and cannibalism of young largemouth bass (*Aplites salmoides*) in state-operated rearing ponds in Michigan during 1935. Am. Fish. Soc. Trans. 66(1936):242-66. 4 figs.
- James, Marian F.  
1946. Histology of gonadal changes in the bluegill, *Lepomis macrochirus* Rafinesque, and the largemouth bass, *Huro salmoides* (Lacépède). Jour. Morph. 79(1):63-92. 2 figs., 2 pls.
- Pennak, Robert W.  
1946. The dynamics of fresh-water plankton populations. Ecol. Mono. 16:339-56. 7 figs.
- Smith, E. V., and H. S. Swingle  
1943. Percentages of survival of bluegills (*Lepomis macrochirus*) and largemouth black bass (*Huro salmoides*) when planted in new ponds. Am. Fish. Soc. Trans. 72(1942):63-7.
- Smith, M. W.  
1940. Copper sulphate and rotenone as fish poisons. Am. Fish. Soc. Trans. 69(1939):141-57.
- Swingle, H. S.  
1945. Improvement of fishing in old ponds. N. Am. Wildlife Conf. Trans. 10(1945):299-308.
- Swingle, H. S., and E. V. Smith  
1943. Factors affecting the reproduction of bluegill bream and largemouth black bass in ponds. Ala. Poly. Inst. Ag. Exp. Sta. Circ. 87. 8 pp.
- Thompson, David H., and George W. Bennett  
1939a. Lake management reports. 2. Fork Lake near Mount Zion, Illinois. Ill. Nat. Hist. Surv. Biol. Notes 9. 14 pp., 4 figs., 1 map.
- Thompson, David H., and George W. Bennett  
1939b. Lake management reports. 3. Lincoln Lakes near Lincoln, Illinois. Ill. Nat. Hist. Surv. Biol. Notes 11. 24 pp., 8 figs.

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NATURAL HISTORY SURVEY DIVISION  
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Volume 24

BULLETIN

Article 4

# The Pseudoscorpions of Illinois

C. CLAYTON HOFF



*Printed by Authority of the State of Illinois*

URBANA, ILLINOIS

*June 1949*

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*This paper is a contribution from the Section of Faunistic Surveys and Insect Identification.*

## FOREWORD

During the latter part of 1946, all the zoological collections of the Illinois Natural History Survey were brought together into one section, formerly the *Insect Survey Section*, which was then renamed the *Section of Faunistic Surveys and Insect Identification*. Previously, the Natural History Survey had published a series of reports on the insects of Illinois and, at the same time, had developed the entomological collections. The double aim of the above reorganization was, first, to effect a well-balanced program in the Survey's faunistic activities with the hope that useful reports on the Illinois fauna would be made for groups other than insects and, second, to build up a comprehensive reference collection of study material for the identification of animal groups occurring in the state.

A firm basis of expansion in several non-insect groups, such as the fish and mollusks, was provided several years ago by the extensive Illinois collections of Stephen A. Forbes, Robert E. Richardson, and Frank C. Baker. Although in recent years certain other groups, especially the arthropods and reptiles, have been fairly well collected in the state along with the insects, our collections of many forms are at a beginning level.

The general aim for all groups is now the one that has been developed for the insects; to build up as extensive and inclusive a collection of Illinois species as possible, and to supplement this with representatives of other North American genera and species in each group.

We feel fortunate in presenting this account of the pseudoscorpions of Illinois as the first report of the expanded part of the program. In 1943 we began a co-operative undertaking with Dr. C. Clayton Hoff, then at Quincy College, Quincy, Illinois, with the view of investigating the pseudoscorpion fauna of the state. At that time we were making extensive ground cover samples in connection with certain insect projects, and this activity dovetailed very well with a sur-

vey of the pseudoscorpions. Dr. Hoff reported such unusual findings, and a fauna so much more extensive than had been expected, that we soon decided to make his study the basis of a thoroughgoing faunistic report on the group for Illinois.

This decision was strengthened by the very apparent need for such a study of the pseudoscorpions. Up to about 1930 the taxonomy of this group in North America was in a preliminary and superficial stage. It was not until comprehensive analyses of the known world fauna were presented by J. C. Chamberlin and Max Beier in the 1930's that a groundwork was laid for modern studies of the group. Since no detailed faunistic report has previously been prepared for any region on the North American continent, we hope that this Illinois report will prove useful to many investigators.

We are grateful indeed to Dr. Hoff for the identification of material and preparation of the manuscript, and for contributing much of his own time to this project. Members of our staff in the Section of Faunistic Surveys and Insect Identification have contributed materially to the project. Several of them have assisted with the field program and with adaptation of the manuscript to current Survey practices. Four total views of pseudoscorpions were prepared especially for this work by Dr. Carl O. Mohr, formerly Associate Entomologist and Artist. Mr. James W. Curfman assisted with the preparation, numbering, and lettering of the plates. Mr. Lewis J. Stannard, Jr., Mrs. Leonora K. Gloyd, and Mrs. Dorothy A. Moulton compiled the index and assisted in assembling the Illinois records, preparing the bibliography, and checking and integrating the manuscript.

We have enjoyed throughout the help and co-operation of the Technical Editor, Mr. James S. Ayars, and Mrs. Drew S. Wetzel and Mrs. Blanche P. Young of his staff.

HERBERT H. ROSS

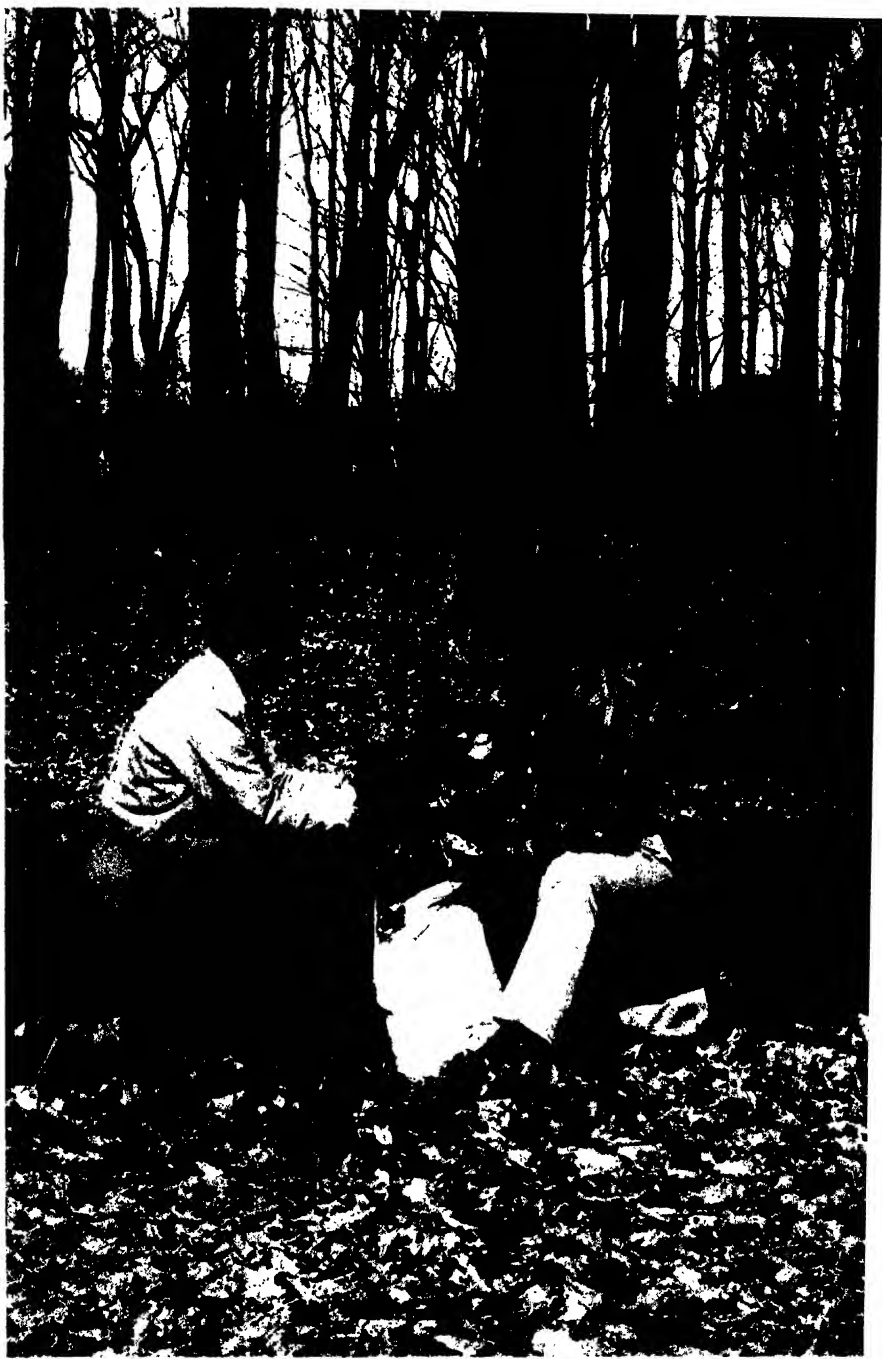
*Systematic Entomologist*





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Ground cover or duff in woods such as these harbors a wide variety of pseudoscorpion species. When a sample is to be collected, the dry top leaves should be brushed away and the moist lower leaves and the top layer of soil scooped up. Samples from the lee of a log are often unusually productive.

# The Pseudoscorpions of Illinois

C. CLAYTON HOFF\*

**P**SEUDOSCORPIONS are minute animals only a few millimeters long, with the general appearance of diminutive scorpions except that they have no tails. They belong to the large phylum of joint-legged animals, the Arthropoda, and to the class Arachnida, which, in addition to the pseudoscorpions, embraces the spiders, mites, ticks, scorpions, and other related groups. Pseudoscorpions are seclusive in habit, occurring in soil cover and rotten logs, under bark, and in similar places out of doors; one species is found in houses. In their natural habitat, these little brown animals are difficult to see, especially when they draw in their legs and "play possum." In this position they look like little specks of dirt. Probably because pseudoscorpions are inconspicuous, few collections of the group have been made in the past, and the fauna, at least of North America, and especially of the central and north-central United States, has remained scantily known. Prior to the initiation of the present studies, only one list was available for this region, that of Ewing (1911), which contained records of six species from Illinois and two additional species from neighboring states.

Two factors have contributed to a considerable expansion of our knowledge of this group for the Illinois region. The first factor was the work of J. C. Chamberlin and Max Beier, both of whom, about 1930, made extensive contributions to the taxonomy of the world fauna of the pseudoscorpions, delineating the suborders, families, and genera clearly for the first time, and utilizing an abundance of new identification characters. The second factor was the development of the Berlese funnel method of collecting pseudoscorpions and associated small animals. This method, described on page 418, has made possible collecting of

large series of many species and obtaining for the first time what appears to be a fairly accurate representation of the total fauna of Illinois. At the present time the list of known Illinois species stands at 26. Undoubtedly, other species will be found with additional collecting; the present study, based on over 5,000 specimens, represents about 350 collections.

The object of this report is twofold, first to present illustrated keys and descriptions for the identification of species in this region, and, secondly, to summarize information regarding the distribution, biology, and habitat preferences of the species. As an aid in use of the keys, a section has been included on morphology, in which the structures now considered of major taxonomic importance are explained.

Summarizing the distribution has been especially difficult because many identifications made prior to Chamberlin's work are probably incorrect and should be rechecked before they are cited. Because of this situation there is little accurate information to serve as a guide in foretelling what additional described species may be collected in Illinois. In order to make this report of wide application, the keys have been made to include all the genera known from the central and northeastern portions of the United States and adjacent portions of Canada.

## BIOLOGY

Available information on the development and habits of pseudoscorpions is meager and is based chiefly on the study of a few large species, most of them of the suborder Monosphyronida. Scarcely any biological information is available for the smaller forms belonging to the suborders Diplosphyronida and Heterosphyronida.

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### Feeding Habits

Pseudoscorpions feed on small animals such as mites, ants, and a wide variety of other insects, as indicated by the many pseudoscorpions observed with such prey in the chelae of the pedipalpi or palps. The pseudoscorpion's mouth, located on a tubular structure called the rostrum, contains a sucking structure, the pharyngeal pump, for taking in liquid food. The pseudoscorpion grasps its prey with the palps. These prehensile organs are supplied with a venom apparatus that effectively kills or anesthetizes the captured prey within a matter of seconds. The palps and chelicerae, together or singly, hold the prey to the mouth and the pseudoscorpion sucks the fluids from the body of its victim.

The larger pseudoscorpions, especially *Chelifer cancroides*, make interesting pets. One may be kept in a small corked vial into which is released a fly occasionally. The pseudoscorpion will stalk the fly patiently for a long time; then suddenly it will reach out a palp and seize the fly. A good-sized house fly will put up quite a struggle, sometimes flying around with the pseudoscorpion attached; sometimes the pseudoscorpion will be stretched out in mid-air, grasping the cork with one chela and the fly with the other; but in a few moments the battle is over, and the fly is completely quiet. Then the feast begins.

Evidence to date indicates that no pseudoscorpions live as ectoparasites on larger animals. Pseudoscorpions occur abundantly in mammal and bird nests, but apparently they are not parasitic on the mammals or birds but instead feed on small arthropods in the nests. Species have been reported as nipping man, but without inflicting any appreciable injury (Beier 1932d, 1941; Feio 1941).

Large numbers of species have been reported from beneath the wings or elytra of beetles, as well as from the bodies of other insects and birds, as described by Vachon (1940, 1947). These cases appear to be nothing more than phoresy, with the pseudoscorpions feeding on mites and other soft-bodied arthropods associated with the larger flying insects and birds. Vachon forcefully expresses the idea that phoresy with few exceptions is confined to the females. He believes that phoresy is a response to insufficient food at a time when the females are carrying and feeding the larval young.

### Enemies

While pseudoscorpions prey upon smaller animals, they are in turn the prey of larger animals, especially birds, as indicated by the frequency with which pseudoscorpion remains are recovered from the digestive tracts of birds. The part played in food cycles appears to be the pseudoscorpions' claim to ecological importance.

### Development

Pseudoscorpions have several distinct stages in their life history: (1) the egg, in most species carried by the female; (2) the larva, in most species also carried by the female; (3) three stages of nymphs, which are free living; and (4) the adult.

The pseudoscorpion female usually produces only a small number of eggs, ranging from 3 or 4 to as many as 30. The eggs in most species are not laid indiscriminately, but are simply extruded from the abdomen and retained as a group attached to the base of the abdomen in contact with the external genitalia. As the eggs are laid, they are grouped in a single-layered rosette or around the periphery of a spherical mass. In either case the egg mass becomes enclosed by a thin membrane.

As young develop within the eggs, the enveloping membrane is lost and the larvae assume positions with their heads toward the center of the rosette or spherical mass. Each of the first stage larvae has a sucking apparatus for feeding, and rudiments of the appendages, nerve ganglia, and other structures. The larvae secure a nutrient fluid secreted from the maternal ovaries, which become modified for this particular function. During the period of larval development, the females of those groups in which the larvae form a single-layered rosette remain active, while the females in which the larvae are arranged in the form of a spherical mass have been observed to seal themselves in a nest and remain inactive. The presence of large amounts of yolk in the eggs of a few species (Essig 1929) suggests that the larvae in these groups develop without attachment to the mother.

As development continues, a second larval stage is formed. In this stage, the sucking apparatus is atrophied and the larva apparently lives on the food accumulated during the first or feeding stage of larval development. Also, during the second larval stage, the appendages and other structures

of the nymph gradually make their appearance.

At the end of the larval development, the first nymphal stage or protonymph escapes from the brood pouch and begins to lead an independent life. The protonymph has essentially the same general appearance as the adult. The continued development includes three molts, and the individual passes successively through the *protonymph*, *deutonymph*, and *tritonymph* stages, to form finally the sexually mature adult stage. At the time of each molt, the nymph secludes itself in a silken nest for a period of 10 or 15 days, during which time distinct morphological reorganizations take place. The various morphological changes that occur between nymphal stages and between the tritonymph and the adult include the gradual addition of tactile setae on the palpal chelae and a gradual change in the shape of various body parts, such as the segments or podomeres of the appendages. The nymphal stages of one Illinois pseudoscorpion, *Apochthonius moestus*, have been discussed in detail by Hoff (1946b); the various stages of another species, *Chthonius tetrachelatus*, have been described by Vachon (1941a, 1941b).

### Maturity and Reproduction

Adult pseudoscorpions are undoubtedly fairly long lived, living probably for 6 months to a year or two. This surmise is based on collecting observations and notes made on a few individuals kept in captivity. Few exact data over an extended period are available.

As is true of their relatives, pseudoscorpions are dioecious. The males and females are similar in appearance. With the possible exception of a few forms, such as the genus *Microbisium*, in which the males have never been found, they reproduce sexually; apparently in the *Microbisium* females reproduce parthenogenetically.

According to Beier (1932d), mating takes place in the spring, during April and May, but this information is based on the study of only a few forms in the holarctic region and possibly cannot be applied to species from other areas. Unfortunately, information relative to mating is from observations of a few species of Monosphyronida only, and generalizations cannot be made for the entire order. In the few species that have received detailed study (Kew 1912), the male and female perform a courtship dance as a part

of the mating activity. During the period of marked sexual activity and the courtship dance, a spermatophore is released by the male. Sperms from this spermatophore are picked up by the female. About 1 month after the transfer of sperms from the male to the female, the eggs are extruded.

### HABITAT PREFERENCES

Pseudoscorpions have invaded many different habitats in almost every part of the world. For the most part, the smaller forms live in debris and fertile soil, the larger forms under stones, under bark of trees, in decaying vegetation, and abundantly in mammal and bird nests. One genus, *Garypus*, is found usually along the seacoast under stones and among algae and seaweeds.

Some species of pseudoscorpions occupy very particular and restricted niches. The habitat relationships of most Illinois pseudoscorpions are summarized below. A few species are omitted as a result of inadequate ecological data.

#### Deciduous Forests

The abundant microhabitats found in the forest, fig. 1, afford the favorite living conditions for pseudoscorpions in Illinois. The species inhabiting forest ground cover and decaying wood are among the most abundant and widely distributed of our pseudoscorpions.

Three species have been found only in ground cover and litter: *Apochthonius moestus*, *Heterochthonius multispinosus*, and *Mundochthonius sandersoni*. *Dactylochelifer copiosus* has been found in the same habitats, and one collection of this species was swept from vegetation.

Five species have been found chiefly in rotting wood or under bark of logs and stumps: *Ferrucaditha spinosa*, *Lamprochernes oblongus*, *Dinocheirus pallidus*, *Pselaphochernes parvus*, and *Acuminochernes crassipalpus*. The last two are especially common in the rotten wood and debris of hollow trees.

Two species, *Parachernes squarrosus* and *Microbisium confusum*, are found both in ground cover and in rotting logs and stumps; *Mirochernes dentatus* occurs in both habitats and also is common in cavities of hollow trees.

Under bark of living trees, chiefly oak and hickory, occurs *Idiochelifer nigripalpus*.



Fig. 1.—Woods at Starved Rock State Park, Illinois. Wooded hillsides offer a wide variety of habitat niches: ground cover, rotten logs, hollow trees, moss, and root tangles. All these are prospective pseudoscorpion habitats.

### Rock Outcrops

Three species have been found associated with rock outcrops, fig. 2. These pseudoscorpions live in the debris and leaf mold on the rock ledges or at the bases of outcrops. *Chthonius tetrachelatus* has been taken in association with limestone outcroppings; *Mundochthonius rossi* and *Larca granulata* have been taken only around sandstone outcroppings.

### Sand Dunes

Our only collections of *Paisochelifer callus* have been taken in grass and ground cover in sand dunes.

### Swamps and Bogs

*Microbisium brunneum* has been taken in Illinois only in the moss and debris in tama-

rack bogs of the northern part of the state and in cypress swamps of the southern tip.

### Domestic Situations

*Chelifer cancroides* is never found in natural habitats removed from habitations of human beings. Around man, however, it is widespread and abundant, occurring in chicken houses, barns, dwellings, beehives, and nests of starlings and sparrows.

### DISTRIBUTION

Pseudoscorpions are found in all parts of the world except in the arctic and the antarctic regions. They reach their greatest degree of development both in population numbers and in diversity of species in the tropics and subtropics. Many of the super-

families or families are world-wide or nearly world-wide in distribution, with at least a few representatives on nearly every large land mass and with a concentration of closely related species on one or two of the continents. Thus, the diplosphyronid superfamily Neobisiidea is holarctic, while the heterosphyronid Tridenchthoniidae and monosphyronid Atemnidae are typically circumtropical. In the Tridenchthoniidae, however, we

find a few species in the nearctic region and in the Atemnidae a few species outside of the distinctly tropical regions. Most of the family and subfamily groups have representatives in a wide geographical area.

Such a widespread distribution appears interesting in a group without apparent means of rapid dispersal. There are several possible ways, however, by which dispersal may be accomplished. The small forms are



Fig. 2.—Sandstone ledges in Starved Rock State Park, Illinois. Dry leaves and sparse grass accumulate on the ledges and in the crevices of these outcrops to form a thin, dry layer of organic material. A few animals, apparently especially adapted to these dry conditions, live here. One of the denizens of these ledges is the Illinois pseudoscorpion *Mundochthonius rossi*.



readily carried by air currents and even the larger species may on occasion be carried in this way just as are many of the insects and spiders. Many forms are no doubt transported by large insects and by mammals and birds. Man may be an important factor in distribution of some species, as indicated by the widespread domestic distribution of *Chelifer cancroides*, and by the many specimens of other pseudoscorpions taken from merchandise at quarantine stations along the seacoast (Chamberlin 1938). Whether any of these latter man-introduced species have ever become established in a new area is not at present known.

As with other animal groups, the Illinois pseudoscorpion fauna contains some species that are widely distributed and even cosmopolitan, and others that are greatly restricted in their geographical ranges. It has seemed worth while to group most of the species taken in the state according to area of distribution. The remainder are recorded from only one or two counties and the data relative to distribution are possibly incomplete. It is possible that the rarity of some species is more apparent than real, and that the apparent rarity results from greatly restricted 'habitat' niches or from an insufficient number of collections. Additional information relative to the distribution records of the various species may be found in the systematic section of this paper.

### Widely Distributed Species

Ten species have been collected from a sufficient number of Illinois localities to indicate that they are widely distributed over the entire state. These include some of our very common forms: *Apochthonius moestus*, *Microbisium confusum*, *Lamprochernes oblongus*, *Parachernes squarrosus*, *Pselaphochernes parvus*, *Acuminochernes crassopalpus*, *Mirochernes dentatus*, *Chelifer cancroides*, *Idiochelifer nigripalpus*, and *Dactylochelifer copiosus*.

*Microbisium brunneum*, associated with bogs or swamps, has been taken at the northern and southern extremities of the state but not in areas between. Among the species infrequently collected, *Chthonius tetrachelatus* and *Illinichernes distinctus* have been taken from northern and southern localities.

### Southern Species

Two species, *Heterochthonius multispinosus* and *Mundochthonius sandersoni*, have

been taken from only the southern tip of the state. *Verrucaditha spinosa* has been found only in the Mississippi River drainage area in the south-central and southern parts of the state.

### Northern Species

To date *Mundochthonius rossi* has been found only in the northern fourth of the state. In the same category are three other species that have been taken occasionally, *Dinocheirus pallidus*, *Dinocheirus solus*, and *Paisochelifer callus*.

### Other Species

Six species that have been collected infrequently are known from central or north-central counties in the state, from the vicinity of Urbana, an area from which we have collected a large number of samples, or from widely separated local areas. Similar intensive collecting in other areas may show these species to have a much wider distribution in Illinois. The six species are *Chthonius ischnocheles*, *Lamprochernes minor*, *Reginachernes ewingi*, *Reginachernes lymphatus*, *Larca granulata*, and *Chelanops (?) corticis*.

## COLLECTING METHODS

Collecting of large pseudoscorpions, especially those belonging to the suborder Monosphyronida, may be done by hand from the bark of trees and logs or by sifting soil, debris, and rotten wood. However, collecting of most pseudoscorpions in these ways is laborious and slow because of the low population density of some species and because of the small size, seclusive habits, and light color of other species, especially those of the suborders Heterosphyronida and Diplosphyronida.

The most efficient method for collecting pseudoscorpions is by the use of Berlese funnels, named after the Italian entomologist Berlese, who first used them extensively. A Berlese funnel is a very simple apparatus, fig. 3, consisting of a fairly long funnel suspended wide end up, with a screen placed about a third of the way down the funnel, with heat applied either around the upper portion of the funnel or over the top of the funnel, and with a container of preservative, preferably 80 per cent ethyl alcohol, around the small bottom opening. Leaf mold, bark scrapings, broken-up rotten

wood, and other material suspected of harboring pseudoscorpions is placed on the screen, the heat source is turned on, and after a day or so the pseudoscorpions leave the dried sample and migrate downward, dropping into the preservative.

half-inch mesh. Clumps of moss, leaves, sod, and pieces of wood or bark are torn up by hand into small fragments as they are put into the sieve; then this material is raked over the sieve and shaken, the sifted material being collected on a cloth or paper, fig. 4.

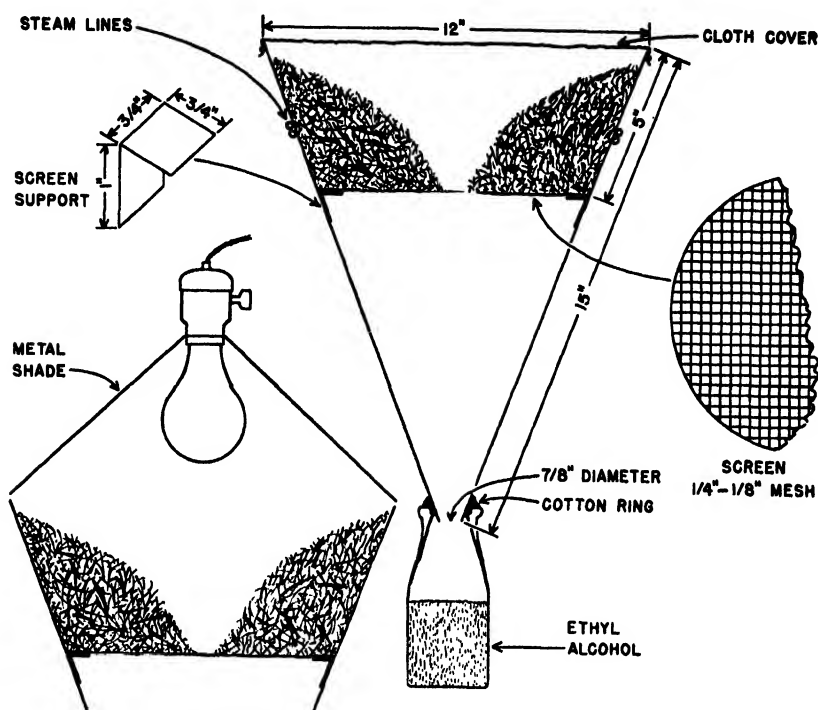


Fig. 3.—Sketch of a Berlese funnel, showing a diagrammatic view across the middle. The central figure shows an arrangement for a steam coil, the lower left for an electric light. The Berlese funnel provides the most efficient method for collecting pseudoscorpions and certain other animals.

Fig. 3 illustrates a funnel that has proved very satisfactory; it is 15 inches from top to bottom and the top has a diameter of 12 inches. The bottom opening, exactly seven-eighths inch in diameter, fits into a half-pint cream bottle, which makes an ideal container for the preservative. Three angled brackets or hangers are soldered inside the funnel to provide a rest for the screen, which is made of a quarter-inch or eighth-inch mesh hardware cloth; the mesh used depends upon the type of sample. A battery of several funnels in a rack will allow the collector to sample a hundred pounds or more of material in one operation.

Samples of leaf mold or other material are brought into the laboratory in cloth bags. Before being put in the funnel, each sample is sifted carefully through a screen sieve of

Pieces of wood or bark are knocked sharply against each other to dislodge any animals that might cling to them. The sifted material is then placed on the screen in the funnel and piled up around the sides to leave a small open space in the center of the screen, fig. 5. This central opening allows the easy migration of animals in the upper part of the sample down into the bottom part of the funnel. The funnel so loaded is then placed in the rack for support, the bottle with preservative is placed under the narrow end, and heat is applied. Funnels in position in rack are shown in fig. 6.

If steam is used as a source of heat, the small copper lines that conduct it act as a partial support for the funnel by encircling it about half way between the screen and the top; a piece of cloth is tied tightly over



Fig. 4.—Sifting Berlese samples. Preparatory to putting material in the funnel, bark and rotten wood are broken up and these and leaf mold sifted through a coarse screen. The siftings are put in the funnel.

the top of the funnel, fig. 3. If an electric light or a choke coil is used for heating, it should be hung directly over the center of the funnel and no cloth tied over the top. With a light or choke coil, it is often well to use a wide reflector that approximates in diameter the diameter of the top of the funnel.

Care must be taken not to heat the sample too rapidly. Otherwise, moisture will condense in the lower part of the funnel and trap many of the animals working their way

toward the bottom, or the heat may kill many of the organisms before they have an opportunity to move out of the sifted material. A little experience furnishes the best gauge of the intensity of heat to be used. An application of heat sufficient to dry the sample in 4 or 5 days is usually satisfactory. As the sample dries, the organisms move out and downward, and finally drop into the bottle of preservative.

The Berlese funnel is extremely useful for collecting many animals in addition to

pseudoscorpions: groups of beetles, particularly Staphylinidae, thrips, Collembola, many groups of parasitic Hymenoptera, ants, millipedes, and centipedes, and a wide range of other minute animals that live in soil, surface cover, logs, or bark.

Samples for the Berlese funnel may be collected at any time of the year. If collected during the warm months, they should be brought to the laboratory and placed in the funnels within a day or two; otherwise considerable loss of population occurs within the samples. If collected during the cold months, they may be kept in cold storage for a week or two with little loss.

The following suggestions may prove helpful in picking up samples. For leaf mold samples, scrape off and discard the dry surface leaves and scoop up the lower, rotted layers of leaves together with an inch or two of the adjacent soil. You may encounter especially good samples where leaves have blown in along the edge of a log (see frontispiece). In such a situation, take some of the log bark with the sample. Collect rotten log samples in large hunks and break them up in the sieve. From either standing stumps or fallen logs in which the wood is still too hard to break up, collect the loose bark, as it is often quite productive. Fre-



Fig. 5.—Material to be sampled is placed on the sieve in the funnel and piled high around the edges; a small opening is left in the center. This arrangement allows an exit to the bottom for pseudoscorpions and other animals that might otherwise be trapped on top of the debris.

quently if you roll a log over, you may find animal runs under it; the debris and earth under and around these runs, together with animal nests, frequently give unusual catches.

Probably the most productive single type of sample is that taken from the interior of a standing hollow tree. At the bottom of the hollow you may find a foot or more of fine, rotten, woody material that you can scoop out by reaching through a break in the base of the tree. A 50- or 60-pound sample of this is almost sure to net many interesting forms. Occasionally you may collect a wet sample, such as sod from a marsh or debris from a stream edge. If you allow it to remain in the sack for a few days it will

usually dry out enough to permit sifting. Allow winter samples to thaw and dry before you sift them.

### PREPARATION OF MATERIAL

Most of the characters used in the identification of pseudoscorpions can be seen only in proper orientation of the specimen and under moderate to high magnifications. For this reason it is necessary to prepare pseudoscorpion specimens carefully so that they may be studied under the compound microscope.

The following method has been found very satisfactory. First, remove from the animal the two chelicerae, the two palps,



Fig. 6.—Funnels in position on rack. In this assembly, each funnel rests inside a double ring of copper tubing (as on funnel at extreme lower left) through which flows live steam. The steam produces the heat that dries out the sample and drives the animals out of it. Cotton or a small rag is tamped between the end of the funnel and the bottle of preservative to prevent escape of specimens.

one of the first, and one of the fourth legs. Leave these in alcohol while the rest of the body is being treated. Next, puncture the body by making a slitlike cut in the side of the abdomen; then place it in a 10 per cent solution of potassium hydroxide. This step is intended to dissolve the muscles and internal organs. Soak the body in cold hydroxide solution for several hours, or in hot solution (heated in a boiling water bath) for a few minutes. The exact amount of time will depend upon the size and darkness of the specimen and can be gauged after a little experience. The object is to clear the preparation in hydroxide long enough to dissolve out the internal material so that the preparation will be transparent, but not long enough to cause marked bleaching or decoloration of the parts. After soaking the preparation in hydroxide, remove it to distilled water and squeeze out the disintegrated viscera by gentle pressure with needle or forceps. Alternately press and release the abdomen several times; this manipulation will cause a pumping action that will remove most of the internal material. Allow the preparation to soak in a fresh water bath for about a day to remove the last traces of dissolved material. After the washing process, dip the body in 1/50 normal hydrochloric acid to neutralize the remaining hydroxide, and put it in 70 per cent alcohol. Next place the cleared preparation and the appendages previously removed in beechwood creosote. After they have completely cleared and dehydrated, mount them in Canada balsam or clarite.

In mounting the specimen, place the body with the ventral side uppermost and the two palps under one cover located a little to the left of the center of the slide, with sufficient room for the slide label to the left of the cover. Mount one of the palps with the dorsal side uppermost. Remove the chela from the other palp and spread the fingers wide apart. Mount this chela with the external or lateral surface uppermost. If the body and palps are heavy and thick, support the cover glass with short pieces of capillary tubing or short pieces of finely drawn glass rod. Mount the chelicerae and the previously removed legs under a smaller cover to the right of the first. Do not use supports under this cover since the cover glass should rest on the legs and press them out flat for measuring.

After clearing with hydroxide and before

mounting some species or stages that are only lightly sclerotized, stain the body in acid fuchsin. Wash the material in dilute hydrochloric acid before putting it into this stain. After staining, wash the preparation in distilled water for some time to bleach out excess stain; then clear it in beechwood creosote and mount as directed above.

Label all slides clearly, indicating collection data and means of associating slide material with similar material in fluid. When an organism is identified, its name should be put on the slide label.

## MORPHOLOGY

As an aid in the use of keys and the accurate identification of species, the important features of the external morphology of pseudoscorpions are outlined below. Additional information is available in the works of Chamberlin (1931a), Beier (1932b, c, d), and Roewer (1936, 1937).

### Body

The body of a pseudoscorpion, fig. 7, is divided into two general parts, the cephalothorax and the abdomen. Both the body and the appendages bear many setae, the number and arrangement of which are of considerable taxonomic importance. In many species, the setae are slender and tapering, but in others they are modified in various ways. Commonly some of the setae are divided or branched at the tips and give somewhat club-shaped silhouettes; these setae are spoken of as clavate or subclavate in allusion to their general appearance. In some cases the branching occurs on only one side of a seta, and in others it extends down both sides of the seta to give a feathered effect. The cephalothorax is covered dorsally by a shield or carapace that is without segmentation, although in some cases one or two transverse furrows subdivide the surface of the carapace.

The mouth is at the anterior end of the cephalothorax and the feeding structure is retracted within a cavity in the anterior portion. In most species, one or more pairs of eyes are situated on or near the lateral margin of the cephalothorax; each eye has a single facet.

The abdomen consists of 12 segments, of which the last is greatly reduced and very inconspicuous. In some species, as indicated in fig. 7, the eleventh and twelfth segments

cannot be seen in strict dorsal view. Each segment of the abdomen bears a dorsal tergite and a ventral sternite, but in many forms each of these is divided medially to form lateral sclerites or areas called tergal and sternal halves. The chaetotaxy and sculpturing of the tergites and sternites are often useful in taxonomy. The tergites are usually regular in arrangement and shape, but the anterior sternites are modified as a result of the presence of the genital opening and its accompanying structures. Toward the lateral end of each third and fourth sternite is a stigma or spiracle through which air is taken into the tracheal system. In the males of a few species, the lateral ends of some of the tergites are modified to form keels. A pleural membrane covers the

abdomen laterally between the sternites and tergites.

### Appendages

A pseudoscorpion bears six conspicuous pairs of segmented appendages, all arising from underneath the cephalothorax: a short pair of pincer-like chelicerae; an elongate pair of palps, each ending in a pincer-like structure; and four pairs of legs, designated in descriptions by Roman numerals. Unlike most of the members of the Arachnida, the pseudoscorpions lack patellae on their appendages.

**Chelicerae.**—Each chelicera, fig. 8, is attached near the anterior end of the cephalothorax and consists of a basal segment or podomere extended anteriorly to

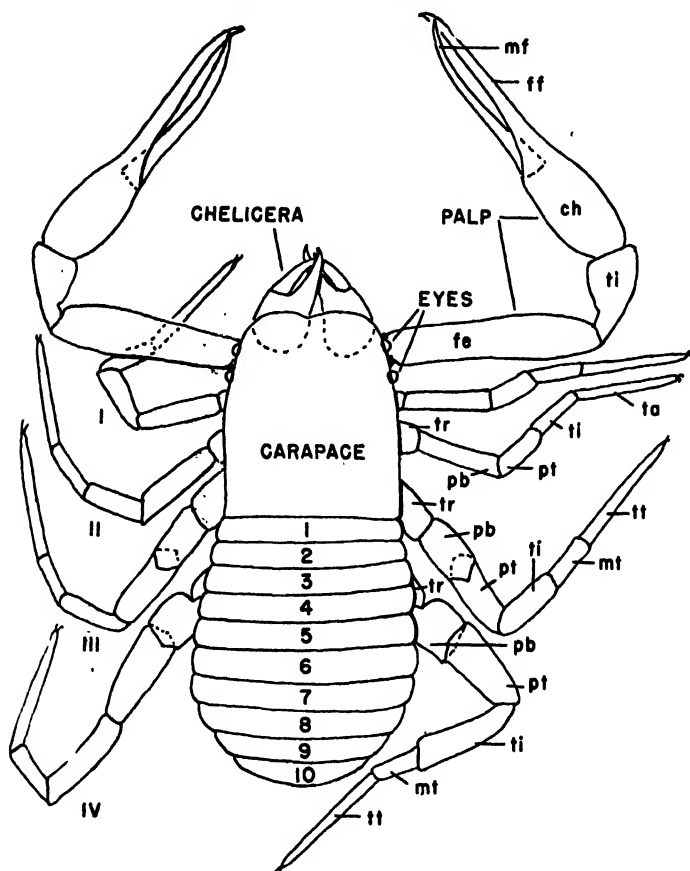


Fig. 7.—Sketch of a heterosphyronid pseudoscorpion to show the general body plan and appendages. The Arabic numerals designate segments of the abdomen; the Roman numerals indicate the four walking legs which arise from under the carapace on the venter of the cephalothorax. Abdominal segments 11 and 12 are not visible in a dorsal view of all species. Abbreviations used are *ch*, chela; *fe*, femur; *ff*, fixed chelal finger; *mf*, movable chelal finger; *mt*, metatarsus; *pb*, pars basalis; *pt*, pars tibialis; *ta*, tarsus; *ti*, tibia; *tr*, trochanter; *tt*, telotarsus. The coxa, which is basad to the trochanter on each leg, is not shown.

form a fixed finger and a second segment to form a movable finger. The dorsal surface of the base of the chelicera bears numerous setae. Those that are of major significance

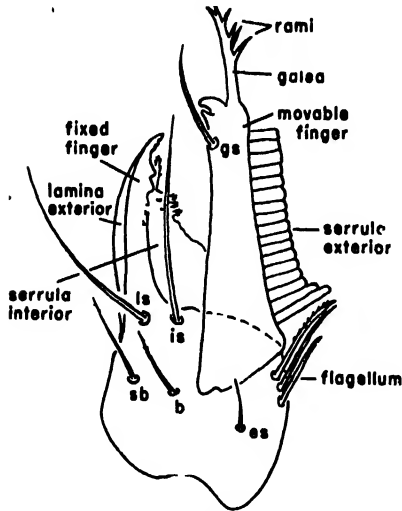


Fig. 8.—*Lamprochernes oblongus* ♀. Exterior or dorsal view of chelicera. The setae important in taxonomy are indicated by the standardized designations: *b*, basal seta; *es*, exterior seta; *gs*, galeal seta; *is*, interior seta; *ls*, laminal seta; *sb*, subbasal seta.

in taxonomy have been designated by letters as shown in fig. 8. The setae vary among species and genera in number, position, and size. The lateral margin of the subventral surface of the cheliceral base bears a flagellum that consists of a few to many modified setae. The fixed finger is usually smaller than the movable cheliceral finger, bears an apical tooth and several denticles along the inner margin, and is supplied with a longitudinal row of plates making up the serrula interior. With exception of the terminal three or four, the plates are frequently fused to form a so-called velum. The outer margin of the fixed finger often bears a longitudinal keel or riblike structure known as the lamina exterior. The movable cheliceral finger has a prominent serrula exterior, consisting of a row of ligulate plates extending along nearly the entire length of the finger. The movable finger terminates in an apical tooth and the inner margin bears either a subterminal lobe or a series of denticles. Near the end of the movable finger is inserted a galeal seta. In some groups, a con-

spicuous galea or spinneret is attached near the end of the movable finger. This galea is said to function in spinning silk discharged from silk gland ducts that open at the tips

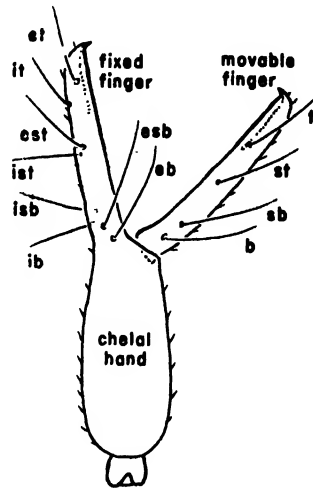


Fig. 9.—*Chelifer cancroides* ♀. Lateral view of chelal hand of palp. The standardized symbols used for the tactile setae of the movable finger are as follows: *b*, basal seta; *sb*, subbasal seta; *st*, subterminal seta; *t*, terminal seta. On the fixed finger, *e* indicates exterior and *i* indicates interior; either is used in connection with *t*, *sb*, and the like. Thus, *et* is the exterior terminal seta, while *it* is the interior terminal seta.

of the galeal branches or rami. When the galea is reduced or wanting, the ducts appear to terminate in a tubercle or directly on the surface near the tip of the finger, fig. 25C.

**Palps.**—The palps, fig. 7, are the most conspicuous appendages of the animal and are usually extended anteriorly. Each palp consists of several segments or podomeres: the coxa or maxilla, the trochanter, the femur, the tibia, and the chela. The chela has a movable finger that no doubt represents an additional segment. The characteristics of the palpal segments most useful in taxonomy are the general shape, the chaetotaxy and sculpturing, the absolute size, and the length-width ratio. The last is fairly constant within each species and use of it is becoming increasingly important for the separation of closely related species. The segments of the palp, especially the chela, in some cases show sexual dimorphism, the



chela of the male frequently being larger and stouter than that of the female.

The characteristics of the chela, fig. 9, are very important in classification. For a satisfactory study of the chela, a side view must be obtained. In such a view, the inner margins of both the fixed and movable fingers in most cases seem to be supplied with small contiguous teeth. In some cases, however, the teeth are alternately large and small, or variable in different parts of the margin. In the family Chernetidae, accessory teeth are borne on the outer and inner aspects of each finger near the marginal teeth. Great taxonomic significance is attached to the number and arrangement of the tactile setae of the fingers. In most species of pseudoscorpions the fixed finger has eight tactile setae and the movable finger has four, as shown in fig. 9. In other species, the number of tactile setae is greater or smaller. Each tactile seta is identified by the bulbous structure or areola from which it originates. One or both of the chelal fingers terminate in a venedens, or venom tooth, through which the venom is discharged. The venom duct can usually be traced proximally to the nodus ramosus, a dilation at the point where the small ducts form individual venom glands or reservoirs unite to form a single duct.

**Legs.**—With respect to the legs, several characteristics such as the number of segments, the nature of the joint between the pars basalis and the pars tibialis of the femur, and the nature of the terminal claws and chaetotaxy are important in classification. The number of segments in the legs is used as the basis for dividing the order Pseudoscorpionida into three suborders. In the suborder Monosphyronida, each leg has six apparent segments: coxa, trochanter, pars basalis and pars tibialis of the femur, tibia, and tarsus. In the suborder Diplosphyronida, the tarsus of each leg consists of the proximal metatarsus and the distal telotarsus, so that the leg appears to be made up of seven segments. In the suborder Heterosphyronida, each first and second leg has a single tarsal segment, whereas each third and fourth leg has two tarsal segments. The nature of the legs in the heterosphyronid pseudoscorpions is shown in fig. 7. In general, the legs do not show sexual dimorphism except occasionally in modifications of the tarsal claws of the first leg.

The coxae of the legs are more or less

rigidly attached to the cephalothorax and can easily be seen in ventral view. In some groups of the Heterosphyronida, one or more of the pairs of coxae bear spines. Some species have a minute seta-bearing tubercle located medially between the third and fourth pairs of coxae.

### Genitalia

In addition to the structures already described, the genital organs are of some importance in taxonomy. The external genitalia are located on the ventral surface of

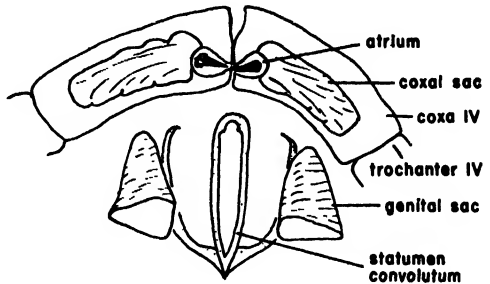


Fig. 10.—*Dactylochelifer copiosus* ♂. Important structures of the male genital complex of the highly specialized type found in the Cheliferidae.

the abdomen in the region of the second and third abdominal segments. The second sternite forms an anterior genital operculum, and the third sternite forms a posterior operculum.

In the female, the genital complex is relatively simple. When better known, it will probably assume greater significance in classification. In some species, a pair of seminal receptacles may be distinguished. These are often in the form of elongated tubules. In many females, perforated plates, known as cribriform plates, are present. The shape, position, and number of these plates are characters used in systematic work. The seminal receptacle and the cribriform plates may be seen in many females cleared with hydroxide.

In the male, the genital complex is more variable than in the female. The chaetotaxy of the opercula can be used on occasion as a specific character. In one group, the subfamily Cheliferinae of the family Cheliferidae, the genital organs of the male are highly modified and specialized, fig. 10. In males of certain genera of this group, each fourth coxa contains a coxal sac either with

or without a separated medial portion known as the atrium. The sclerotized statumen convolutum may or may not be invaginated anteriorly. When an anterior invagination occurs, the invagination contains a short sclerotized rod.

### ACKNOWLEDGMENTS

This investigation has been made possible by the encouragement, co-operation, and assistance of many persons and organizations interested in the fauna of Illinois. Co-operative effort has resulted in the accumulation of a greater number of collections of pseudoscorpions than has ever been previously massed together at one time from any one state. The total number of collections made available for this study is about 350, of which two-thirds are from the collections of the Illinois Natural History Survey. Fifty-seven collections were taken by the writer. Other collections were loaned by the Illinois State Museum, the Chicago Natural History Museum, the American Museum of Natural History, the Museum of Comparative Zoology, and the Cornell University Museum. The two museums last named made available type specimens and material collected and recorded from Illinois by H. E. Ewing.

The writer wishes to acknowledge the assistance of the following persons who either collected pseudoscorpions or aided in some other way toward the completion of this study: Dr. H. H. Ross, Dr. T. H. Frison, Dr. H. B. Mills, Dr. M. W. Sanderson, Dr. M. M. Leighton, Dr. A. E. Emerson, Dr. and Mrs. Clarence Goodnight, Dr. Heinz A. Lowenstam, Dr. W. J. Gertsch, Prof. Nathan Banks, Dr. H. J. Van Cleave, Dr. V. E. Shelford, Dr. Carl O. Mohr, Dr. Kathryn M. Sommerman, Rev. Edbert Long, Rev. Robert Brinker, Dr. C. L. Remington, Mr. Willis E. Snow, Mr. and Mrs. W. F. Rapp, Jr., Dr. B. D. Burks, Mr. Gilbert M. Wright, Mr. Lewis J. Stannard, Jr., and Mr. Henry Dybas. The writer's sincere appreciation is especially extended to Dr. J. C. Chamberlin for information from his personal files of unpublished data and for the loan of specimens from his personal collection.

This study was carried out chiefly while the writer was employed at Quincy College, Quincy, Illinois, continued while he was at the Colorado Agricultural and Mechanical

College, Fort Collins, Colorado, and completed while he was at the University of New Mexico, Albuquerque, New Mexico. Deep appreciation is extended to these institutions and their officials for facilities and time, without which this project could not have been completed. This study was aided also by a grant from the American Association for the Advancement of Science through the Illinois State Academy of Science.

### CLASSIFICATION

The order Pseudoscorpionida or Chelone-thida, embracing all of the pseudoscorpions, is set off from other orders of the class Arachnida by the following combination of characters: carapace unsegmented, fig. 7, covering the cephalothorax; abdomen segmented, not divided into pre- and post-abdomen; no sting on the abdomen; chelicerae small and chelate; palps large and chelate; respiration by means of simple tracheae.

The order is divided into three suborders, each of which is represented in the fauna of Illinois. These suborders in turn are divided into a system of superfamilies, families, and lower categories in order to facilitate grouping together related genera and demonstrate as far as possible natural relationships. The general classification followed here is that outlined summarily in papers by Chamberlin (1929*b*, 1930, 1931*a*) and extended or modified by Beier (1932*b*, *c*, *d*). These papers as a group give a comprehensive outline of the classification of the entire pseudoscorpion world fauna, together with full bibliographic treatment of the supergeneric names involved. Material in these papers is not repeated in the present paper, but instead the interested student is referred to them for further study.

The bibliographic citations given in the present paper for species or genera are not intended to be complete. They consist of references to the original description, to papers in which are given diagnoses more nearly complete than the original, to publications that contain important changes in taxonomic position or nomenclature, and to papers that have definite reference to the fauna of Illinois.

In this paper a complete diagnostic characterization of a species is given only for species that are new or for which no recent and complete description is available in the literature. For other species, a summary of

diagnostic characters is given and reference made to available extended descriptions.

Measurements throughout this paper are in millimeters.

### Disposition of Material

Most of the Illinois material recorded here and not otherwise noted is in the collection of the Illinois Natural History Survey at Urbana, Illinois. Some material that belongs to other institutions is cited, and this usually is indicated by letters following the record. The letters used are as follows:

CH—Collection of C. Clayton Hoff, University of New Mexico, Albuquerque, N. Mex.

CM—Chicago Natural History Museum, Chicago, Ill.

CR—Collection of C. L. Remington, Yale University, New Haven, Conn.

CU—Cornell University, Ithaca, N. Y.

HV—Collection of H. J. Van Cleave, University of Illinois, Urbana, Ill.

IM—Illinois State Museum, Springfield, Ill.

JC—Collection of J. C. Chamberlin, Forest Grove, Ore.

MCZ—Museum of Comparative Zoology, Harvard College, Cambridge, Mass.

WS—Collection of Willis E. Snow, Urbana, Ill.

### Systematic List

To date there are Illinois records for 26 species of pseudoscorpions. Of these, two are known only on the basis of literature records. They are indicated by an asterisk in the following list.

#### Suborder HETEROSPHYRONIDA

##### Family TRIDENCHTHONIIDAE

##### Subfamily Tridenchthoniinae

##### Tribe Verrucadithini

*Verrucaditha spinosa* (Banks)

##### Family CHTHONIIDAE

##### Subfamily Chthoniinae

##### Tribe Chthoniini

\**Chthonius ischnocheles* (Hermann)

*Chthonius tetrachelatus* (Preysslér)

*Apochthonius moestus* (Banks)

*Heterochthonius multispinosus* Hoff

*Mundochthonius rossi* new species

*Mundochthonius sandersoni* new species

#### Suborder DIPLOSPHYRONIDA

##### Family NEOBISIIDAE

#### Subfamily Neobisiinae

*Microbisium brunneum* (Hagen)

*Microbisium confusum* Hoff

#### Family GARYPIDAE

*Larca granulata* (Banks)

#### Suborder MONOSPHYRONIDA

##### Family CHERNETIDAE

##### Subfamily Lamprochernetinae

*Lamprochernes oblongus* (Say)

*Lamprochernes minor* new species

##### Subfamily Chernetinae

*Parachernes squarrosus* new species

*Pselaphochernes parvus* Hoff

*Reginachernes ewingi* new species

*Reginachernes lymphatus* new species

*Dinocheirus pallidus* (Banks) new combination

*Dinocheirus solus* new species

*Acuminochernes crassopalpus* (Hoff) new combination

*Mirochernes dentatus* (Banks)

*Illinichernes distinctus* new species

\**Chelanops* (?) *corticis* Ewing

#### Family CHELIFERIDAE

##### Subfamily Cheliferinae

##### Tribe Cheliferini

*Chelifer cancroides* (Linnaeus)

*Idiochelifer nigripalpus* (Ewing)

*Paisochelifer callus* (Hoff)

##### Tribe Dactylocheliferini

*Dactylochelifer copiosus* Hoff

The keys to suborders, superfamilies, and families are designed to accommodate the entire fauna known at present from America north of Mexico. Where used, the subfamily keys are designed for the same fauna. Keys to tribes and genera are intended primarily to resolve the fauna of the central and eastern United States and adjoining portions of Canada. Keys to species include those taken in Illinois and in addition a few species that are known from surrounding states and that ultimately may be found in this state.

#### KEY TO SUBORDERS

- Each first and second leg with five segments exclusive of the coxa, and each third and fourth leg with six segments exclusive of the coxa, fig. 7. . . . . **Heterosphyronida**, p. 429
- All legs with the same number of segments . . . . . 2
- Tarsus of each leg divided into metatarsus and telotarsus, so that the leg has six segments exclusive of the coxa. . . . . **Diplosphyronida**, p. 443

Tarsus of each leg not divided, so that the leg has five segments exclusive of the coxa.....**Monosphyronida**, p. 449

### Suborder **HETEROSPHYRONIDA**

Members of this suborder may be recognized by the single tarsal segment in the first and second legs and the two tarsal segments in the third and fourth legs. Both families represented in North America are known from Illinois. Both may be recognized by the extremely large chelicerae, fig. 11, as well as by the key characters.

#### KEY TO FAMILIES

Most abdominal tergites with a double row of closely spaced, short and stout setae extending completely across each segment; respiratory spiracles of third and fourth sternites obliquely placed and with differentiated guard sclerites, fig. 12E; body and palps very setose and granular; spines on coxae I and II, fig. 12D.....

.....**Tridenchthoniidae**, p. 429

Abdominal tergites with only a single row of long and slender setae across each segment; respiratory spiracles of third and fourth sternites transversely placed and without guard sclerites differentiated from the sternites, fig. 15D; body and palps no more than weakly granular; Illinois species with spines on coxa I, fig. 15C, on coxa II, or on coxae II and III.....**Chthoniidae**, p. 431

### **TRIDENCHTHONIIDAE**

Pseudoscorpions belonging to this group can be recognized by the obliquely placed stigmata or respiratory spiracles, fig. 12E, that are guarded by well-developed sclerites. Some exotic genera have only a single row of stout setae across the abdominal tergites.

In America north of Mexico the family is represented by a single genus, *Verrucaditha*. Diagnosed in relation to the world fauna by Chamberlin & Chamberlin (1945), this genus is placed in the subfamily Tridenchthoniinae and tribe Verrucadithini.

#### 1. **VERRUCADITHA** Chamberlin

*Alura* Chamberlin (1926, p. 334). Genotype, by original designation: *Chthonius spinosus* Banks. (Name preoccupied by *Alura* Moeschler 1883.)

*Verrucaditha* Chamberlin (1929b, p. 59). New name for *Alura* Chamberlin.

*Verrucaditha* Chamberlin. Chamberlin & Chamberlin (1945, p. 22).

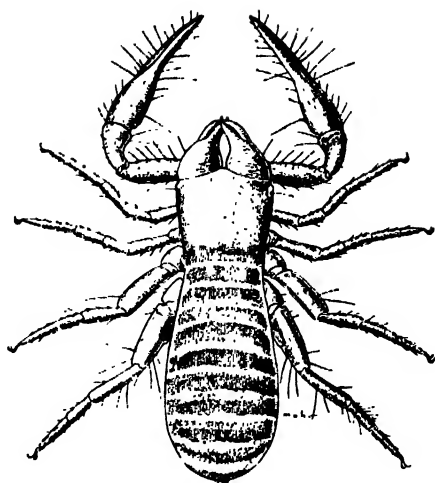


Fig. 11.—*Apochthonius moestus*, an example of the suborder Heterosphyronida and the family Chthoniidae.

Members of this genus possess movable chelal fingers on which the marginal teeth are broad, rounded, and contiguous. Only one nearctic species is known.

#### *Verrucaditha spinosa* (Banks)

*Chthonius spinosus* Banks (1893, p. 67).

*Verrucaditha spinosa* (Banks). Chamberlin (1929b, p. 59), Chamberlin & Chamberlin (1945, p. 24), Hoff (1946b, p. 103).

In general, the following combination of characteristics serves to identify adults without mounting: body length 1.0–1.3 mm.; carapace with about 100 heavy lanceolate investing setae, fig. 12B, and with the anterior carapacic margin distinctly bilobed; the pair of tactile setae on the dorsum of each chelal hand removed from the proximal margin of the hand by about one-fourth its length, figs. 12A, 12C; spines on coxae I and II, fig. 12D. For more extensive descriptions of this species, the reader is referred to Chamberlin & Chamberlin (1945) and Hoff (1946b).

**DEUTONYMPH.**—The following description is based on one individual. This stage has not been described previously in the literature. The deutonymph in general resembles the adult, length 0.82 mm., greatest width of abdomen 0.35 mm. Carapace anteriorly bilobed, each lobe with four stout marginal setae; eyes conspicuous. Chelicera very similar to that of the tritonymph as previously reported (Hoff 1946b) except that there are three rather than two galea-like processes near the end of the movable

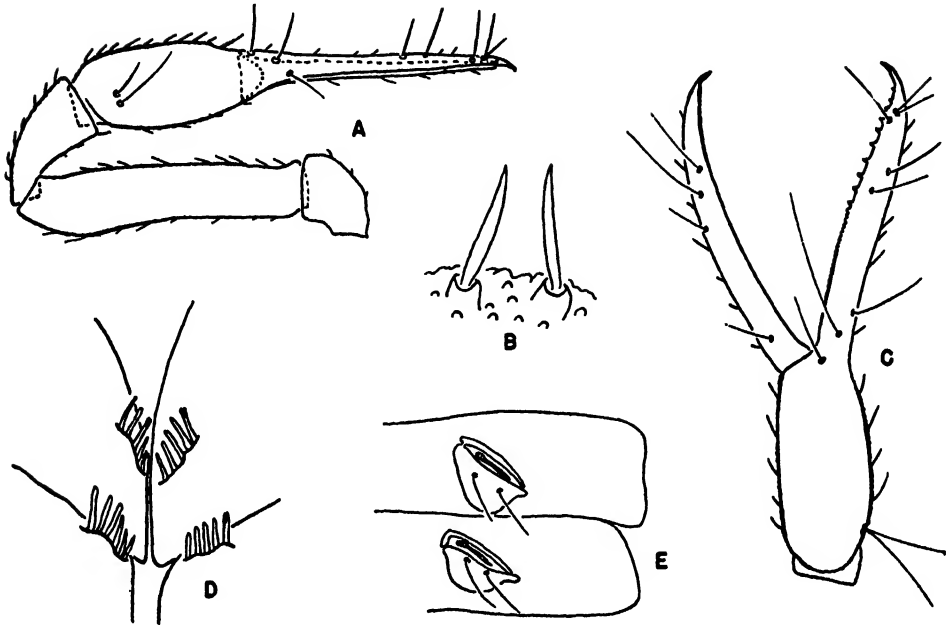


Fig. 12.—*Ferrucaditha spinosa*. A, dorsal view of palp ♂; B, setae of carapace; C, exterior view of chela, ♀; D, coxal spines, ♂. E, stigmata or respiratory spiracles, ♀.

finger and 10 rather than 14 plates in the serrula exterior. Three to five spines occur on each of coxae I and II. Segments of palps weakly granulate and light yellow in color. Palp with femur 0.205 mm. long, 0.07 mm. wide; tibia 0.125 mm. long, 0.075 mm. wide; chela 0.4 mm. long, 0.082 mm. wide; depth of hand equal to width, length about 0.13 mm.; movable finger 0.26 mm. long. Fixed chelal finger with seven tactile setae, *ds* and *et* near distal end, *it* and *est* near center, two setae near base of finger, and one (*isb* or *ib*) a little proximad to the mid-point of the dorsum of the hand; movable finger with two tactile setae near center. Marginal teeth similar in appearance to those of the adult; movable finger with 24 marginal teeth; fixed finger with 11 acute and well-separated teeth in the distal half of the finger and 10 more nearly contiguous teeth on the proximal half of the finger margin.

**DISTRIBUTION.**—*Verrucaditha spinosa* does not occur abundantly in Illinois. Of eight records, four are from Adams County and one each from Brown, Jackson, Jersey, and Madison counties. The species is widely distributed in the central and southeastern part of the United States as shown by existing records (Chamberlin & Chamberlin 1945).

This species usually occurs in debris and decaying wood of old stumps and logs in deciduous forests. One collection was taken from "ground cover" and one from fallen needles under an eastern redcedar tree (*Juniperus virginiana* Linnaeus).

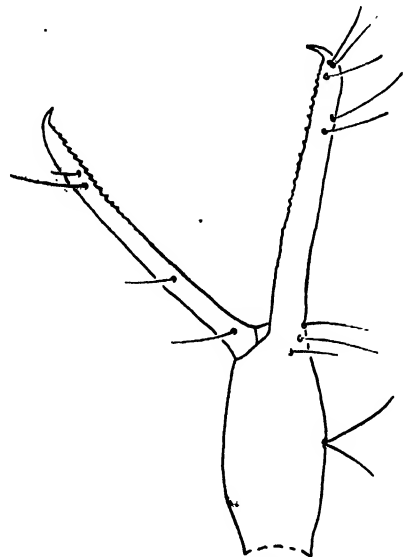


Fig. 13.—*Chthonius ischnocheles*. Lateral view of chela. (After Chamberlin.)

**Illinois Records.**—ADAMS COUNTY: 1943, C. C. Hoff, 1 ♂; Coe's Spring, Oct. 28, 1944, Rev. Edbert Long, 1 ♂, 2 ♀ (1 ♂, 1 ♀, CH). EDWARDSVILLE: Sept. 24, 1943, Ross & Sanderson, 1 immature. GRAFTON: Sept. 30, 1943, Ross & Sanderson, 1 ♂. MAKANDA: Oct. 12, 1933, Frison & Ross, 1 ♂. QUINCY: southwest of, July 8, 1944, C. C. Hoff, 1 immature (CH); south of, July 8, 1944, C. C. Hoff, 1 ♂. SILOAM: Siloam Springs, Aug. 29, 1945, C. C. Hoff, 1 immature (CH).

## CHTHONIIDAE

Species belonging to this family may be recognized by the transversely placed spiracles that are not accompanied by separate guard sclerites, fig. 15D. All four Illinois genera belong to the subfamily Chthoniinae and the large tribe Chthoniini. Members of this tribe possess two tactile setae (*isb* and *ib*), figs. 14A, 15A, in a transverse pair on the dorsum of each chelal hand.

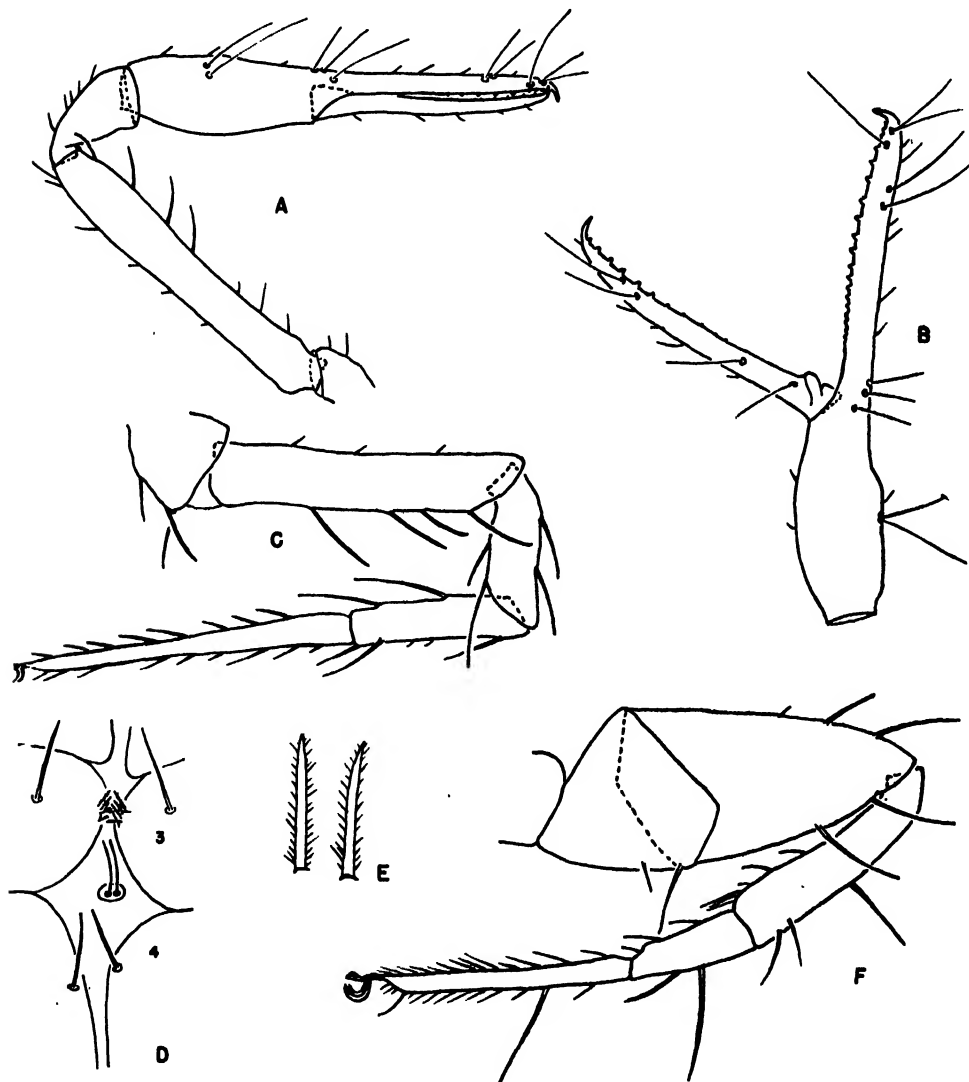


Fig. 14.—*Chthonius tetrachelatus*. A, dorsal view of palp, ♂; B, external view of chela, ♂; C, first leg, ♂; D, parts of coxae II, III, and IV, showing the spines of coxa III and the tubercle and setae, ♀; E, two isolated coxal spines enlarged to show structure, ♂; F, fourth leg, ♂, drawn to a much smaller scale than first leg, C. If the specimen is shrunk in mounting, the tubercle and setae in D are difficult to see.

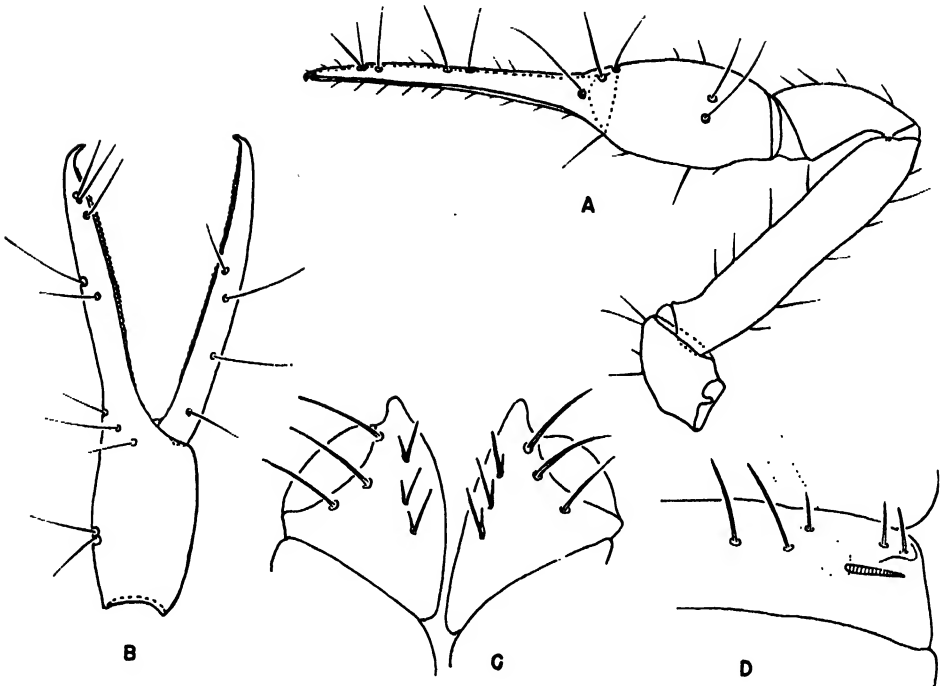


Fig. 15.—*Apochthonius moestus*. A, palp in dorsal view, ♀; B, chela in lateral view, ♀; C, spines of coxa I, ♀; D, stigma on sternite 3, ♀.

KEY TO GENERA

1. Eyes absent; body length 2.3 mm.....  
.....6. *Genus? packardi*
- Eyes present, or, if wanting or vestigial,  
body length less than 1.5 mm.....2
2. Mesal portion of coxa I containing a group  
of well-separated spines, often in a row,  
each spine arising from an elongate slit,  
fig. 15C; intercoxal tubercles not present  
on the mid-line between any of the  
coxae.....3
- Mesal portion of coxa I without such  
spines; instead a comb of short spines  
or a group of short, feathered spines  
present on the mesal region of coxa II or  
coxae II and III, figs. 14D, 17E; a  
minute intercoxal tubercle bearing two  
small setae present between the junc-  
tion of coxae III and IV.....4
3. Teeth along margins of chelal fingers short  
and broad, arranged close together,  
fig. 15B.....3. *Apochthonius*  
Chelal teeth widely spaced, alternately  
large and small, fig. 16C.....  
.....4. *Heterochthonius*
4. A group of well-separated, short, feathered  
spines present on each mesal margin of  
coxae II and III, figs. 14E, 14D.....  
.....2. *Chthonius*
- Short coxal spines in the form of a comb,  
frequently united at bases, present only

on the mesal portion of coxa II, figs.  
17D, 18D.....5. *Mundochthonius*

2. *CHTHONIUS* C. Koch

*Chthonius* C. Koch (1843, p. 76). Genotype,  
by subsequent designation of Simon (1879):  
*Obisium orthodactylum* Leach.

*Chthonius* C. Koch. Chamberlin (1929b, p.  
69), Chamberlin (1931a, p. 212), Beier  
(1932b, p. 43).

The genus *Chthonius* is characterized by  
the presence of an intercoxal tubercle, spines  
on coxae II and III, and simple teeth (not  
always contiguous) on the inner margins of  
the chelal fingers, figs. 14B, 14D. Several  
subgenera have been outlined in the liter-  
ature. Of these subgenera, two are repre-  
sented in Illinois, each by one species. Other  
species in the genus are known from  
Georgia, North Carolina, and California.

KEY TO SUBGENERA AND SPECIES

- Teeth of inner margins of chelal fingers large,  
acute, uncrowded, and somewhat conical  
and recurved; chelal hand appearing evenly  
rounded on the dorsal margin as viewed  
from the side, fig. 13. Subgenus *Chthonius*  
.....*Ischnocheles*

Teeth of inner margins of chelal fingers long and pointed, often well separated; in lateral view, the chelal hand displays a depression between the tactile seta of the dorsum of the hand and the finger base, fig. 14B. Subgenus *Ephippiochthonius*.....**tetrachelatus**

#### Subgenus *Chthonius* C. Koch

*Chthonius* s. str. C. Koch. Beier (1932b, p. 47).

Members of this subgenus may be recognized by the large, acute, and retroconical (pointing toward the base of the finger) marginal teeth of the chelal fingers. The marginal teeth in some species are well separated, at least in the distal part of the fixed finger. The chelal hand has an evenly rounded contour as viewed from the side, there being no dorsal depression near the base of the fixed finger. A single species of the subgenus has been taken in the Illinois fauna.

#### *Chthonius ischnocheles* (Hermann)

*Chelifer ischnocheles* Hermann (1804, p. 113).

*Chthonius pennsylvanicus* Hagen (1869, p. 52).

*Chthonius pennsylvanicus* Hagen. Ewing (1911, p. 80).

*Chthonius ischnocheles* (Hermann). Chamberlin (1929b, p. 71).

*Chthonius* (*Chthonius*) *ischnocheles* (Hermann). Beier (1932b, p. 48).

The species can be recognized from the characters given in the keys. The following additional characters are listed by Beier (1932b). Cephalothorax with 20 to 24 setae, the posterior margin with four to six equally long setae. Setae of the tergites: 4:4:4:4:6:6:6:6. Marginal teeth of the palpal fingers pointed, triangular in outline, and directed somewhat toward the base of the finger, fig. 13. Teeth of movable finger almost as strong as those of the fixed finger. Coxa II with at least 14 spines, coxa III with at least 9 spines. Intercoxal tubercle with two setae. Body length 1.6–2.4 mm.; palpal hand 0.5 mm. long, 0.27 mm. wide; finger length 0.85 mm.

**DISTRIBUTION.**—Ewing (1911) reported a single individual of this species from Hillery, Vermilion County, Illinois. No additional collections have been secured in our recent survey. The species has a wide distribution and is reported from many localities in Europe and from the northeastern part of the United States (Chamberlin 1929b). More Illinois records of this species would be useful.

#### Subgenus *Ephippiochthonius* Beier

*Ephippiochthonius* Beier (1930a, p. 323).

Genotype, by present designation: *Scorpio tetrachelatus* Preyssler.

Members of this subgenus are recognized by the presence of 18 setae on the carapace, of which two are on the posterior margin; in lateral view, the chelal hand displays a depression between the tactile setae of the dorsum of the hand and the finger base, fig. 14B; teeth of chelal fingers are long, pointed, and usually well separated. A single species has been taken in Illinois.

#### *Chthonius tetrachelatus* (Preyssler)

*Scorpio tetrachelatus* Preyssler (1790, p. 59).

*Chthonius tetrachelatus* var. *maculatus* Menge.

Stecker (1875, p. 314).

*Chthonius longipalpus* Banks (1891, p. 164).

*Chthonius longipalpus* Banks. Ewing (1911, p. 80).

*Chthonius tetrachelatus* (Preyssler). Vachon (1941a, p. 442).

*Chthonius* (*Ephippiochthonius*) *tetrachelatus* (Preyssler). Hadzi (1933a, p. 139; 1933b, p. 179), Hoff (1946b, p. 109).

Individuals of this species may be recognized by the characteristics given in the key, especially by the shape of the chelal hand and the nature of the marginal teeth of the chelal fingers, fig. 14B. No detailed description is included here, since the species has been treated recently and adequately by Hadzi (1933a, 1933b) and Vachon (1941a, 1941b). The adults and most nymphs (but not the protonymph) in our collections agree well with those described by Vachon, except that the palpal segments of our specimens appear to be a little more slender than indicated in Vachon's drawings.

I have examined a single protonymph that apparently belongs to this species. Unfortunately, this protonymph was not associated with adults and, as a result, the identification may be questioned. The individual differs radically from the form described by Vachon (1941a, 1941b) as the protonymph of *tetrachelatus*. Possibly Vachon studied the last larval stage rather than the first nymphal stage, or protonymph, since his drawings do not appear to be made of animals sufficiently developed to be protonymphs. Because of limited material and questionable identification, the protonymph I have examined that apparently belongs to this species is not described here.

**DISTRIBUTION.**—*Chthonius tetrachelatus* was taken by the writer in 11 collections in



the vicinity of Quincy, Adams County. In addition, a single individual was present in a collection made by Henry Dybas near Mooseheart, Kane County. The only other record available is from Herod, Pope County, and consists of the questionable protonymph mentioned above. The species has a wide distribution in Europe and northern Africa and has been reported from the New England states and Indiana in the United States (Chamberlin 1929b).

Ecological data are available only for the collections taken in Adams County. Here the species was found chiefly in debris and leaf mold in woods, frequently in the vicinity of limestone outcroppings along the bluffs of the Mississippi River.

**Illinois Records.**—HEROD: Oct. 12, 1933, ground cover in woods, Frison & Ross, 1 protonymph. MOOSEHEART: Sept. 1, 1939, Henry Dybas, 1 specimen (CM). QUINCY: Oct. 10, 1943; Nov. 1, 1943; July 2, 1944; July 29, 1944; Aug. 13, 1944; all by C. C. Hoff, many specimens.

### 3. *APOCHTHONIUS* Chamberlin

*Apochthonius* Chamberlin (1929b, p. 66).

Genotype, by original designation: *Chthonius moestus* Banks.

*Apochthonius* Chamberlin (1929c, p. 152).

*Apochthonius* Chamberlin. Beier (1932b, p. 41).

The genus includes pseudoscorpions with the following characteristics: 22 to 24 setae on the carapace; four eyes; each coxa I with three simple seta-like coxal spines, each spine originating from a cleft or fissure on the surface of the coxa, fig. 15C; intercoxal tubercle lacking; chelicera with seven setae on the hand; marginal teeth of the chelal fingers small, contiguous, and occupying nearly the full length of the finger margins, fig. 15B. One species, *moestus*, occurs in eastern North America; two others in the north Pacific Coast region, *occidentalis* Chamberlin and *intermedius* Chamberlin.

#### *Apochthonius moestus* (Banks)

*Chthonius moestus* Banks (1891, p. 165).

*Apochthonius moestus* (Banks). Chamberlin (1929b, p. 67), Hoff (1944a, p. 125; 1945c, p. 311; 1946b, p. 105).

This species can be separated easily from other Illinois pseudoscorpions by the three coxal spines on each coxa I and by the small and contiguous marginal teeth on the chelal fingers. Diagnostic characteristics are illustrated in figs. 11 and 15.

**DISTRIBUTION.**—*Apochthonius moestus* is widely distributed over Illinois; it has been identified in 65 collections from various parts of the state. The species appears to be distributed over most of the United States east of the Great Plains region.

One of the more common pseudoscorpions in the eastern and central states, *moestus* is found very abundantly in the litter and debris on the ground in deciduous woods. It has also been taken from beneath the bark of decaying logs, in moss, and in mammal nests.

**Illinois Records.**—Many specimens, taken throughout the year, are from Alhambra, Alto Pass, Anna, Bond County, Burksville, Cadiz, Charleston, Collinsville, Danville, Dolson (Clarksville), Eichorn, Fountain Bluff, Ganntown, Geff, Giant City State Park, Grafton, Herod, Kellerville, La Rue (Wolf Lake), Marshall, Monticello, New Salem State Park, Oakwood, Pocahontas, Quincy, Sherman, Starved Rock State Park, Urbana, Vienna, West Vienna, and White Heath.

### 4. *HETEROCHTHONIUS* Chamberlin

*Heterochthonius* Chamberlin (1929c, p. 153).

Genotype by original designation: *Apochthonius* (*Heterochthonius*) *crobyli* Chamberlin.

*Heterochthonius* Chamberlin. Hoff (1945c, p. 313).

The members of this genus are similar to members of the genus *Apochthonius* but differ in having the marginal teeth of the chelal fingers with at least the distal teeth well separated and typically composed of alternating large and small teeth; coxa I with three to six spines; carapace with 20 to 24 setae. Only two species are known in the genus, both from the eastern half of the United States, but only one is recorded from Illinois.

#### KEY TO SPECIES

Body length 1.6–2.0 mm.; length-width ratio of palpal femur greater than 4:5, usually greater than 5:0. . . . . *multispinosus*  
Body length 1.3 mm.; length-width ratio of palpal femur 3:8. . . . . *crobyli*

#### *Heterochthonius multispinosus* Hoff

*Heterochthonius multispinosus* Hoff (1945c, p. 314).

This is the only pseudoscorpion thus far found in Illinois that has four to six (in one specimen, three) spines on each coxa I and

the marginal teeth of the chelal fingers well spaced and alternately large and small, figs. 16B, 16C.

**MALE.**—The present individuals agree well with the type specimens. A study of specimens from Duke Forest, the type locality, and from Illinois shows that much greater variation occurs than was indicated in the study of the restricted type material. The following measurements and observations are based on five males from Illinois. Body length 1.65–1.85 mm.; carapace 0.46–0.51 mm. long, 0.43–0.47 mm. wide; abdomen 1.15–1.35 mm. long, 0.65–0.7 mm. wide. Chelicera 0.33–0.39 mm. long, base 0.19–0.24 mm. wide; movable finger 0.2–0.235 mm. long; serrula exterior with 16 to 18 ligulate plates. Palp with trochanter 0.21–0.215 mm. long, 0.12–0.125 mm. wide; femur 0.65–0.73 mm. long, 0.12–0.13 mm. wide, length 5.4 to 5.65 times the width (ratio of 5.1:1 in type specimens, but ratio in other Duke Forest specimens similar to that in many individuals from Illinois); tibia 0.26–0.29 mm. long, 0.13–0.145 mm. wide, length 1.9 to 2.05 times the width; chela 0.93–1.05 mm. long, 0.185–0.2 mm. wide, length 5.0 to 5.25 times the width; chelal hand 0.37–0.42 mm. long, 0.195–0.205 mm. deep; movable chelal finger 0.56–0.65 mm. long (a little less than in the type specimens) and light yellow in color (not reddish-brown as given in the original description). First leg with pars basalis 0.36–0.4 mm. long, 0.07–0.075 mm. deep; pars tibialis 0.16–0.195 mm. long, 0.065–0.073 mm. deep; tibia 0.21–0.24 mm. long, 0.05–0.057 mm. deep; tarsus 0.4–0.43 mm. long, 0.045–0.05 mm. deep. Fourth leg with entire femur 0.57–0.63 mm. long, pars basalis 0.2–0.23 mm. deep; pars tibialis 0.18–0.215 mm. deep; tibia 0.37–0.425 mm. long, 0.08–0.087 mm. deep; metatarsus 0.2–0.225 mm. long, 0.65–0.70 mm. deep; telotarsus 0.39–0.45 mm. long, 0.04–0.044 mm. deep; tactile seta removed from the proximal margin of the tarsus by 0.12–0.13 mm., being farther removed from the proximal margin than indicated for the type material (Hoff 1945c).

**FEMALE.**—In general, the female resembles the male except that the body and appendages are longer and that many of the segments of the appendages are stouter. The following measurements are of two females, each measurement of one followed in parentheses by the corresponding measurement of the other. Body length 1.98 (1.85) mm.;

carapace 0.53 (0.55) mm. long, 0.49 (0.52) mm. wide; abdomen 1.45 (1.28) mm. long, 0.56 (0.7) mm. wide. Chelicera with finger 0.285 (0.26) mm. long, serrula exterior with 17 (19) plates. Palp with trochanter 0.26 (0.26) mm. long, 0.145 (0.145) mm. wide; femur 0.81 (0.79) mm. long, 0.156 (0.15) mm. wide; tibia 0.335 (0.31) mm. long, 0.175 (0.16) mm. wide; chela 1.18 (1.15) mm. long, 0.245 (0.245) mm. wide; chelal hand 0.495 (0.48) mm. long, 0.255 (0.25) mm. deep; chelal finger 0.7 (0.68) mm. long. First leg with pars basalis 0.425 (0.405) mm. long, 0.087 (0.078) mm. deep; pars tibialis 0.2 (0.—) mm. long, 0.08 (0.08) mm. deep; tibia 0.255 (0.25) mm. long, 0.061 (0.062) mm. deep; tarsus 0.46 (0.43) mm. long, 0.053 (0.051) mm. deep. Fourth leg with pars basalis 0.255 (0.22) mm. deep; pars tibialis 0.24 (0.2) mm. deep; entire femur 0.7 (0.67) mm. long; tibia 0.475 (0.44) mm. long, 0.105 (0.09) mm. deep; metatarsus 0.258 (0.24) mm. long, 0.08 (0.07) mm. deep; telotarsus 0.48 (0.46) mm. long, 0.053 (0.045) mm. deep; tactile seta 0.13 (0.135) mm. from proximal margin of tarsus.

**TRITONYMPH.**—Much like the adult but smaller and segments of the appendages stouter. Body about 1.4 mm. long; carapace with both length and width about 0.4 mm.; abdomen 1.1 mm. long, about 0.65 mm. wide. Chelicera with movable finger stouter than in the adult and with a subterminal nodule in which terminate a number of gland ducts; serrula exterior with 16 ligulate plates; movable finger 0.18 mm. long, basal setae apparently fewer than in the adult. Palpal segments conspicuously stouter than in the adult, color a little lighter, setae not so strongly developed. Palp with trochanter 0.19 mm. long, 0.1 mm. wide; both femora 0.5 mm. long, one femur 0.115 mm. wide, the other 0.12 mm. wide; tibia 0.215 mm. long, about 0.13 mm. wide; chela 0.78 mm. long, 0.175 mm. wide; chelal hand 0.29 mm. long, 0.17 mm. deep; movable finger 0.51 mm. long. Marginal teeth of chelal fingers much as in the adult except fewer in number on the fixed finger and with less difference in size between the alternating large and small teeth. Movable finger with three tactile setae: *st* not much distad from the mid-point of the finger, *t* about two areolar diameters distad from *st*, *b* removed from the proximal finger margin by less than twice the width of the finger at the level

of *b*. Fixed finger with *est* about midway between *ist* and the finger tip; *it* about three areolar diameters distad from the level of *est*; other setae much as in the adult except one of the setae on the dorsum of the chelal hand is wanting. The segments of the legs generally shaped as in the adult except much smaller and stouter; telotarsus of fourth leg subfusiform. First leg with pars basalis 0.258 mm. long, 0.066 mm. deep; pars tibialis 0.133 mm. long, 0.061 mm. deep; tibia 0.145 mm. long, 0.048 mm. deep; telotarsus 0.285 mm. long, 0.042 mm. deep. Fourth leg with entire femur 0.42 mm. long, 0.158 mm. deep; tibia 0.285 mm. long, 0.072 mm. deep; metatarsus 0.152 mm. long, 0.06 mm. deep; telotarsus 0.292 mm. long, 0.046 mm. deep; tactile seta removed from the proximal margin of the telotarsus by about 0.075 mm.

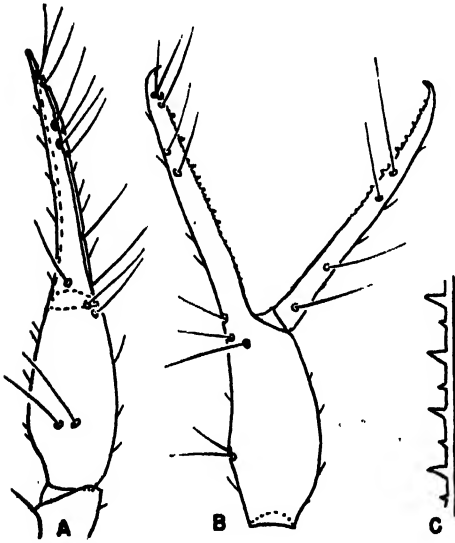


Fig. 16.—*Heterochthonius multispinosus* ♂. A, chela, dorsal view; B, chela, lateral view; C, more distal marginal teeth of chela.

**DISTRIBUTION.**—This species is infrequent in Illinois, having been taken in only four collections. Two of these collections were from Pope County, one from Jackson County, and one from Hardin County. The only other record is from Duke Forest, Durham, North Carolina, the type locality. The number of specimens found in the Illinois collections is small: four males, two females, and one tritonymph.

This species has been taken only from ground cover, both in Illinois and in North Carolina.

**Illinois Records.**—CADIZ: Nov. 6, 1942, Ross & Sanderson, 2♂, 1♀. FOUNTAIN BLUFF: Feb. 22, 1933, Ross & Mohr, 1 immature. HEROD: Oct. 12, 1933, Frison & Ross, 2♂ (1♂, CH); Oct. 18, 1944, Ross & Sanderson, 1♀.

*Heterochthonius crosbyi* (Chamberlin)

*Apochthonius* (*Heterochthonius*) *crosbyi* Chamberlin (1929c, p. 153).

This species is known only from North Carolina, but may eventually be found in Illinois.

Recently the writer has been able, through the kindness of Henry Dietrich of the Cornell University Agricultural Experiment Station, to examine the holotype of *Heterochthonius crosbyi*. A comparison of *crosbyi* and *multispinosus* indicates that *crosbyi* is much smaller than *multispinosus* and that there is no possibility of confusing the two species. The following measurements were secured of the type of *crosbyi* and serve to supplement descriptive material given in the literature: body length 1.3 mm. (not 1.5 mm. as recorded in the original description, Chamberlin 1929c); each palp with femur 0.5 mm. long and 0.13 mm. wide; chela somewhat damaged but apparently about 0.78 mm. long; movable chelal finger 0.54 mm. long.

5. *MUNDOCHTHONIUS* Chamberlin

*Mundochthonius* Chamberlin (1929b, p. 64).

Genotype, by original designation: *Mundochthonius erosidens* Chamberlin.

*Mundochthonius* Chamberlin. Beier (1932b, p. 36).

Members of the genus *Mundochthonius* may be recognized by the simple chelal teeth; each tergite with usually four to eight setae; intercoxal tubercle with two setae; only coxa II with spines, figs. 17D, 17E. Previously, the genus was known from a number of species recorded from the western United States and from Japan. The two Illinois species described below constitute the first records of this genus east of the Rockies in North America.

KEY TO SPECIES

Palpal femur longer than 0.3 mm.; chela longer than 0.5 mm.; length of palpal chela (with an occasional exception) at least 4.2 times the width; mesal comb of coxa II irregularly fused at base, figs. 17D, 17E . . . . . *rossi*  
Palpal femur always shorter than 0.3 mm.; chela shorter than 0.5 mm.; length of palpal

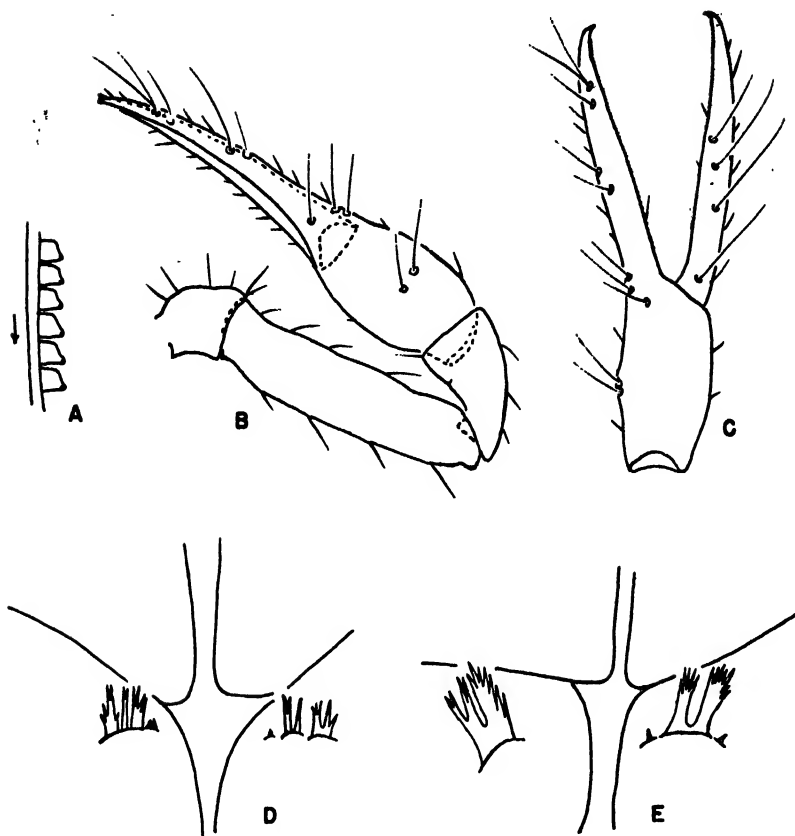


Fig. 17.—*Mundochthonius rossi*. A, teeth of distal part of margin of fixed chelal finger, holotype, ♂, arrow points proximad; B, dorsal view of palp, paratype, ♂; C, lateral view of chela, holotype, ♂; D, spines of coxa II, paratype, ♀; E, spines of coxa II, allotype, ♀.

chela always less than 4.2 times the width; mesal comb of coxa II fused symmetrically at base to form a fan-shaped structure, fig. 18D. .... *sandersoni*

#### *Mundochthonius rossi* new species

Individuals of this species may be recognized by characteristics given in the key and illustrated in figs. 17B, 17D.

**MALE.**—Unless otherwise indicated, observations and measurements are based on four individuals. Body and palps light yellow in color; body and appendages moderately slender; body length 1.05–1.2 mm. Carapace subquadrate; two very weakly developed eyes, each located about its own diameter from the anterior carapacic margin; eyes hardly discernible in caustic-treated individuals. Anterior margin of carapace medially serrate with a small triangular, but variable, epistome; anterior margin of carapace with six setae, of which

the farthest lateral one of each side is located a little distance from the actual carapacic margin and close to the eye; posterior margin of carapace with two setae; total setae on carapace 18; carapace smooth except for netlike markings on the sides and sometimes along the posterior margin; carapace narrowed a little toward the anterior end, sides slightly convex; length of carapace 0.38–0.41 mm.; width a little greater than the length, 0.385–0.415 mm.; ocular width 0.38–0.39 mm. Tergites 1 and 2 each with four setae, tergites 3 through 9 each with six setae; tergites almost smooth, undivided. Medial setae of sternites much longer than lateral setae. Pleural membranes with regular rows of fine punctations. Length of abdomen 0.7–0.8 mm., greatest breadth 0.41–0.48 mm.

**Chelicera.**—A little darker than the carapace; base with six setae, almost smooth. Length of chelicera 0.27–0.29 mm., width

of base 0.155–0.16 mm. Fixed finger basally stout, terminally narrowed and acute; tip of apical tooth brown and sclerotic; inner margin of finger with about 10 conical and acute denticles, usually the distal first and third much larger than the others. Movable finger moderately stout, gently curved, especially near the tip; tip of apical tooth brown and sclerotic; spinneret represented by a rounded and poorly developed knob, apparently without gland ducts; galeal seta near the mid-point of the finger; inner margin of movable finger with about eight denticles, much like those of the other finger in general appearance; serrula exterior with 13 to 15 ligulate plates; length of movable finger about 0.16 mm.

*Palp.*—Fig. 17B. Moderately stout, chela slender; surface of segments smooth. Measurements given as the limits of range secured from four mounted individuals. Trochanter with flexor margin flatly convex in the center and with a few long setae; 1.5–1.7 mm. long, 0.92–0.103 mm. wide; length 1.6 to 1.7 times the width. Femur subcylindrical, extensor margin weakly convex or nearly straight in middle, more convex near the ends; flexor margin slightly convex beyond the mid-point; setae of the flexor surface much longer than those of the extensor surface; 0.345–0.365 mm. long, greatest width just distad from the mid-point and equal to 0.085–0.09 mm., length between 4.0 and 4.15 times the width. Tibia with a few long and slender setae, especially on the extensor surface; outer margin convex, inner margin weakly concave to straight; widest across the extreme distal end; 0.177–0.2 mm. long (usually greater than 0.19 mm.), 0.105–0.11 mm. wide; length between 1.65 and 1.85 times the width. Chela with hand rather stout and fingers slightly curved; both margins of hand evenly convex, but with the flexor margin in most individuals conspicuously more convex than the extensor; chela 0.55–0.585 mm. long, 0.122–0.132 mm. wide, length 4.4 to 4.5 times the width; chelal hand 0.203–0.21 mm. long; depth of hand nearly equal to the width; movable finger 0.36–0.385 mm. long. Viewed from the side, chelal hand, fig. 17C, with ventral margin moderately and evenly convex; dorsal margin slightly convex, especially in the region of the tactile setae of the dorsum of the hand; fixed finger nearly straight, movable finger slightly curved. Marginal teeth of chelal

fingers subquadrate at the distal end of the row and each tooth with a small cusp on the proximal corner; teeth of the proximal part of each row acuminate and somewhat rounded and flattened; teeth, fig. 17A, regularly spaced along virtually the entire finger margin; each finger with usually between 50 and 60 teeth. Tactile setae of chela arranged as indicated in fig. 17C.

*Legs.*—Measurements and observations based on two males; whenever the two show a significant difference, the measurement of the holotype is followed in parentheses by the corresponding measurement of a male paratype. Surfaces of segments smooth; setae not abundant except on the distal segments; each coxa II with three (occasionally two) to five irregular and usually serrate spines, these fused at their bases. First leg with pars basalis subcylindrical, slightly deeper across the distal end than elsewhere, 0.192 (0.201) mm. long, 0.053 mm. deep; pars tibialis with weakly convex extensor margin, more convex flexor margin, 0.11 (0.115) mm. long, 0.05 (0.053) mm. deep; tibia subcylindrical, 0.118 (0.128) mm. long, 0.038 (0.041) mm. deep; tarsus tapering a little toward the distal end, 0.2 (0.217) mm. long, 0.034 mm. deep. Fourth leg with pars basalis very stout, 0.145 mm. deep; pars tibialis 0.133 (0.137) mm. deep; entire femur 0.327 (0.345) mm. long; tibia with the distal one-half of the flexor margin markedly convex, 0.247 (0.258) mm. long, 0.068 (0.071) mm. deep; metatarsus with both margins nearly straight, much less deep at the distal than at the proximal end, 0.1 (0.112) mm. long, 0.05 (0.051) mm. deep; metatarsus with a conspicuous pseudotactile seta on the extensor surface not far from the proximal margin; telotarsus subcylindrical, 0.208 (0.205) mm. long, 0.036 (0.035) mm. deep, a pseudotactile seta placed 0.068 (0.07) mm. from the proximal margin.

*Genital Complex.*—Posterior operculum with about eight marginal setae; 20 to 25 setae superficially placed on each side of the genital opening; about 10 setae on the anterior operculum.

*FEMALE.*—Unless otherwise indicated, observations and measurements are based on three individuals; measurements given are the limits of range. Like the male in virtually all respects; body length 1.08–1.2 mm.; carapace 0.4–0.43 mm. long, width equal to length; abdomen 0.4–0.55 mm. wide.

*Chelicera.*—Like that of the male except

the spinneret is better developed, forming a nodule in which gland ducts appear to terminate; serrula exterior of 14 ligulate plates; length of chelicera 0.27–0.31 mm., width of base 0.16–0.185 mm.; movable finger variable, 0.165–0.195 mm. long.

*Palp.*—Much as in the male but segments possibly a little larger and femur a little stouter. Trochanter 0.152–0.19 mm. long, 0.093–0.11 mm. wide, length 1.63 to 1.73 times the width; femur 0.34–0.395 mm. (allotype 0.372 mm.) long, 0.091–0.102 mm. wide, length 3.7 to 3.93 (allotype 3.93) times width; tibia 0.183–0.22 mm. long, 0.103–0.129 mm. wide, length 1.7 to 1.8 times width; chela 0.55–0.635 mm. (allotype 0.58 mm.) long, 0.125–0.155 mm. wide, length 4.1 to 4.45 (allotype 4.45) times width; chelal hand 0.205–0.24 mm. (allotype 0.217 mm.) long, depth equal to width; movable finger 0.37–0.41 mm. (allotype 0.38 mm.) long. Viewed laterally the shape of hand and fingers, as well as the dentation and chaetotaxy of fingers, essentially as in the male.

*Legs.*—As in the male; spines of coxa II extremely variable, figs. 17D, 17E. Sometimes longer than width of base (as in the allotype). Measurements given are of two individuals, each measurement of the allotype followed in parentheses by the corresponding measurement of the female paratype. First leg: pars basalis 0.205 (0.216) mm. long, 0.055 (0.061) mm. deep; pars tibialis 0.112 (0.129) mm. long, 0.053 (0.061) mm. deep; tibia 0.129 (0.137) mm. long, 0.04 (0.044) mm. deep; tarsus 0.215 (0.23) mm. long, 0.034 (0.036) mm. deep. Fourth leg: pars basalis 0.14 (0.155) mm. deep; pars tibialis 0.13 (0.137) mm. deep; entire femur 0.354 (0.38) mm. long; tibia 0.263 (0.29) mm. long, 0.069 (0.076) mm. deep; metatarsus 0.114 (0.118) mm. long, 0.052 (0.061) mm. deep; telotarsus 0.225 (0.235) mm. long, 0.036 (0.04) mm. deep; tactile seta located 0.076 (0.08) mm. from proximal margin of the telotarsus.

*Genital Complex.*—Position of mounted specimens prevents description of the chaetotaxy of the genital complex. However, one female examined in alcohol had 8 to 10 setae on the posterior operculum and 10 setae on the anterior operculum. The genital complex is simple and not sclerotized.

*TRITONYMPH.*—General appearance as in the male but appendages and body smaller, stouter, and lighter in color; cara-

pac epistome less prominent than in adult; tergal chaetotaxy much as in the adult; body 0.86 mm. long; carapace 0.29 mm. long, greatest width 0.28 mm., ocular and posterior width 0.26 mm.; abdomen 0.56 mm. long, about 0.35 mm. wide.

*Chelicera.*—Details much as in the adult, but lighter in color, smaller, and stouter; about eight setae in the flagellum; serrula exterior of 12 to 13 plates; length of chelicera 0.21 mm.; length of movable finger 0.133 mm.

*Palp.*—Measurements of the single available tritonymph as follows: trochanter 0.135 mm. long, 0.084 mm. wide; femur 0.267 mm. long, 0.075 mm. wide; tibia 0.152 mm. long, 0.091 mm. wide; chela 0.43 mm. long, 0.103 mm. wide; chelal hand 0.16 mm. long, 0.103 mm. deep; movable finger 0.29 mm. long. Viewed laterally, fingers somewhat stouter than in male; dorsal margin of hand nearly straight; marginal teeth of same general nature as in male but slightly fewer in number. Movable finger with three setae, difficult to homologize definitely with the setae of the adult; one seta, possibly *t*, located slightly distad from the mid-point of the finger; a second seta, possibly *st*, placed somewhat proximad from the mid-point of the finger and about three areolar diameters from the first seta; *sb* probably wanting; *b* removed from the proximal finger margin by a distance about equal to the width of the finger at the level of the seta. Fixed finger with tactile setae much as in the adult except only one seta on the dorsum of the hand.

*Legs.*—Segments essentially as in the adult except much smaller and stouter; each coxa II with four or five apparently simple spines, unequal in length. First leg: pars basalis about 0.15 mm. long, 0.049 mm. deep; pars tibialis 0.085 mm. long, 0.045 mm. deep; tibia 0.095 mm. long, 0.037 mm. deep; telotarsus 0.148 mm. long, 0.03 mm. deep. Fourth leg: pars basalis 0.11 mm. deep; pars tibialis 0.102 mm. deep; entire femur 0.258 mm. long; tibia 0.193 mm. long, 0.06 mm. deep; metatarsus 0.08 mm. long, 0.045 mm. deep; telotarsus 0.159 mm. long, 0.038 mm. deep; seta 0.045 mm. from proximal margin of telotarsus.

*DEUTONYMPH.*—Observations based on one mounted individual. Body and appendages smaller and stouter than in the tritonymph; body not treated with caustic, and chaetotaxy of carapace and tergites not ob-

served; body 0.75 mm. long; carapace nearly 0.24 mm. long, about 0.29 mm. wide, posterior width 0.28 mm., ocular width 0.24 mm.; two weakly developed eyes; abdomen about 0.52 mm. long, 0.3 mm. wide.

*Chelicera*.—Much like that of the tritonymph; flagellum with about six setae; slightly fewer marginal teeth on fingers and apparently fewer setae on the base; serrula exterior with 10 plates; movable finger 0.102 mm. long.

*Palp*.—Segments fairly stout; trochanter with the flexor margin irregularly convex, 0.103 mm. long, 0.068 mm. wide; femur distinctly subcylindrical in outline, 0.19 mm. long, 0.059 mm. wide; tibia with extensor margin convex, flexor margin weakly concave, 0.12 mm. long, 0.075 mm. wide; chela 0.325 mm. long, 0.083 mm. wide; chelal hand 0.12 mm. long, 0.08 mm. deep; movable chelal finger 0.215 mm. long. Viewed laterally, fingers appear fairly stout, both a little curved; 30 to 35 teeth on each finger, the teeth of the basal one-third of each finger distinctly rudimentary. Movable finger with two tactile setae, one (possibly *st*) located just within the basal one-third of the finger and the other (possibly *t*) located a little distance proximad from the mid-point of the finger. Fixed finger with setae somewhat as in the tritonymph except *it* and *est* relatively more basal in position, and only two setae (probably *esb* or *eb* wanting) in the group near the base of the finger.

*Legs*.—Segments much smaller and stouter than in the tritonymph; spines of each coxa II variable, both simple and deeply incised spines present. First leg (measurements subject to possible error as the leg was not dissected from the specimen): pars basalis 0.1 mm. long, 0.036 mm. deep; pars tibialis 0.065 mm. long, 0.036 mm. deep; tibia 0.068 mm. long, 0.034 mm. deep; tarsus about 0.12 mm. long, 0.029 mm. deep. Fourth leg not in a position favorable for measuring.

**Holotype, male**.—Starved Rock State Park, Illinois: May 6, 1944, M. W. Sanderson.

**Allotype, female**.—Starved Rock State Park, Illinois: Nov. 8, 1943, mossy debris on shelves. Ross and Sanderson.

**Paratypes**.—ILLINOIS.—STARVED ROCK STATE PARK: Same data as for holotype, 5♂, 1♀, 1 tritonymph; same data as for allotype, 2♂, 1♀. WHITE PINES FOREST STATE PARK: July 14, 1944, Frison & Sanderson, 2♀, 1 deutonymph, 2 tritonymphs.

The following are additional Illinois records not included in the paratype series: AMBOY: Dec. 6, 1945, Ross & Sanderson, 1 specimen. MOUNT CARROLL: Smith Park, Dec. 6, 1945, 8 specimens. WHITE PINES FOREST STATE PARK: soil cover in oak-hickory grove, Oct. 8, 1933, J. Alsterlund, 1 specimen.

This species occurred in eight collections from the northern one-fourth of the state, all taken from ground cover and debris, especially around sandstone outcroppings. Many of the collections were from Starved Rock State Park and White Pines Forest State Park, where conditions are favorable for the preservation of the original fauna.

#### *Mundochthonius sandersoni* new species

This species can be identified by characteristics given in the preceding key and illustrated in fig. 18.

**MALE**.—Measurements and ratios represent the limits of range of four individuals. Small, fragile, light yellow in color; body and appendages moderately stout; body length 0.75–0.9 mm. Carapace nearly square in dorsal outline; surface virtually smooth except marked on the sides by netlike lines; posterior margin straight, lateral margins usually a little convex; subtriangular epistome with a conspicuously serrate margin; four setae along the posterior carapacic margin; total setae on the carapace probably 20 (difficult to determine in specimens examined); eyes vestigial, often entirely wanting; length of carapace including the epistome 0.28–0.31 mm., greatest width about equal to the length, posterior width slightly less than the greatest width and ranging from 0.27 to 0.31 mm. Abdomen weakly ovate; tergites and sternites not divided; tergites 1, 2, and 3 each with four acuminate setae, more posterior tergites each with six setae; sternites 5 through 11 with 8 to 10 acuminate setae; setae of sternite 4 not determined in the male; length of abdomen 0.5–0.6 mm., width 0.3–0.37 mm. Pleural membranes finely and weakly papillose.

*Chelicera*.—Large in ratio to the rest of the animal; slightly darker in color than the body and legs; 0.19–0.215 mm. long, width of base 0.115–0.13 mm.; base with six acuminate setae; lateral surfaces of base spinose, spines very short and readily seen only in relief; flagellum of about nine slender plumose setae. Fixed finger curved, apical

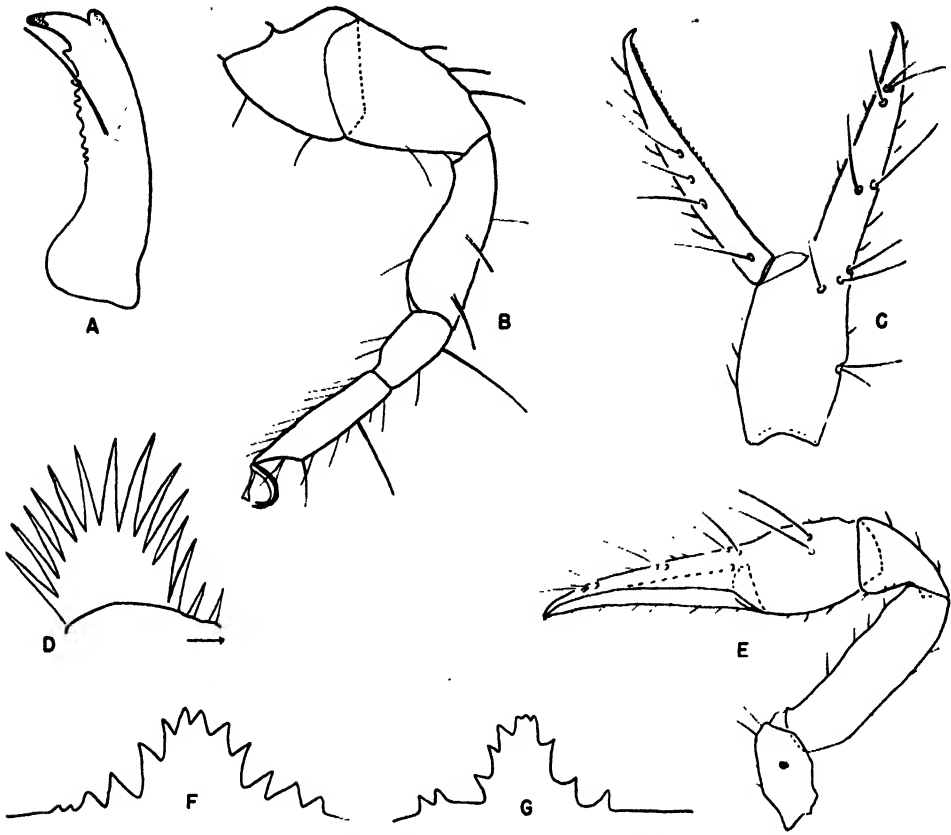


Fig. 18.—*Mundochthonius sandersoni*. A, movable cheliceral finger, serrula omitted, paratype, ♀; B, fourth leg, paratype, ♀; C, lateral view of chela, holotype, ♂; D, coxal spines, paratype, ♂; E, dorsal view of palp, paratype, ♂; F, epistome, paratype, ♀; G, epistome, paratype, ♀, another variation.

tooth sclerotized and strong; nearly 12 acute teeth along the internal finger margin, the distal tooth very heavy, teeth toward base weaker; serrula interior reduced. Movable finger 0.1–0.13 mm. long; galeal seta long, inserted near the mid-point of the finger; apical tooth strong and sclerotic; galea represented by a prominent knob, which appears to be the terminus for a few gland ducts; usually between 8 and 10 acute, conical teeth along the distal one-half or two-thirds of the finger margin, with the most distal tooth larger than the others and located some distance from the next more proximal tooth; serrula exterior of 14 to 15 ligulate plates.

**Palp.**—Fig. 18E. Light yellow in color with chela very slightly darker than the rest of the palp; moderately stout; segments with a few acuminate setae; segments smooth except the dorsum of the chelal hand. Trochanter with irregular flexor margin,

usually flatly convex in the central portion; 0.114–0.123 mm. long, 0.064–0.072 mm. wide, length 1.7 to 1.8 times the width. Femur subcylindrical; inner margin slightly concave, outer margin nearly straight in the central portion but convex at each end, widest in the distal half; 0.22–0.25 mm. long, 0.064–0.072 mm. wide, length 3.45 to 3.65 times the width. Tibia subtriangular, widest across the extreme distal end; inner margin weakly concave, outer margin convex, usually a little flatly convex; 0.125–0.15 mm. long, 0.077–0.084 mm. wide, length between 1.63 and 1.73 times the width. Chela with hand moderately stout; fingers slender, strongly but evenly curved in dorsal view; hand with outer margin flatly convex, inner margin more convex; 0.37–0.42 mm. long, 0.091–0.102 mm. wide, length 4.0 to 4.15 times width; hand 0.136–0.152 mm. long, 0.09–0.1 mm. deep; movable finger 0.25–0.285 mm. long, usually 0.27



mm. or more. Viewed laterally, dorsal and ventral margins of the hand weakly convex, fig. 18C, with the arc of the dorsal margin broken by the insertion of the two tactile setae, *ib* and *isb*, on the dorsum of the hand; fixed finger in lateral view with straight inner margin, outer margin weakly convex, finger tapering rapidly in the distal one-fourth; movable finger more slender than the fixed finger. Both fingers usually with from 45 to 55 marginal teeth, varying in structure from the distal ones, which are subquadrate and each with a cusp on the proximal corner, to the proximal ones, which are rounded and acuspid; teeth spaced along most of the finger margin. Tactile setae as in fig. 18C.

*Legs*.—Moderately stout, light yellow in color; scattered acuminate setae, numerous only on the distal segments. A flat, semilunar blade on each coxa II, fig. 18D; the blade irregularly and deeply incised along the margin and showing considerable interspecific variation; blade wider than long; two or three minute short spines often located medially from the blade. First leg with trochanter 0.064–0.075 mm. long, length 1.23 to 1.33 times the depth; pars basalis subcylindrical, deepest near the distal end, 0.118–0.133 mm. long, 0.04–0.045 mm. deep, length 2.9 to 3.05 times the depth; pars tibialis stout, 0.065–0.073 mm. long, length between 1.62 and 1.73 times the depth; tibia with extensor margin nearly straight, flexor margin weakly convex, 0.076–0.087 mm. long, 0.03–0.034 mm. deep, length 2.5 to 2.56 times the depth; tarsus tapering slightly toward distal end, 0.129–0.145 mm. long, 0.025–0.027 mm. deep, length between 4.9 and 5.4 times the depth. Fourth leg with femur stout; chaetotaxy and color much as in the first leg; pars basalis 0.097–0.105 mm. deep; pars tibialis 0.09–0.098 mm. deep; entire femur 0.215–0.24 mm. long, length 2.22 to 2.35 times the depth; tibia with the basal one-third of the extensor margin slightly convex, distal two-thirds of the extensor margin almost straight, flexor margin weakly S-shaped, greatest depth in the distal one-third, 0.158–0.175 mm. long, 0.05–0.055 mm. deep, length 3.15 to 3.3 times the depth; metatarsus stout, a sensory seta near the basal one-fourth of the extensor margin, 0.061–0.072 mm. long, 0.037–0.041 mm. deep, length 1.6 to 1.95 times the depth; telotarsus subcylindrical, margins nearly straight, setae of flexor sur-

face very numerous, 0.122–0.136 mm. long, 0.027–0.3 mm. deep, length 4.47 to 4.54 times the depth; seta of extensor surface of telotarsus removed by 0.03–0.035 mm. from the proximal margin of the segment.

*Genital Complex*.—Anterior operculum with 10 to 12 scattered setae; posterior operculum with 12 to 16 marginal setae; 8 to 10 setae on the lateral rim of each side of the aperture; setae small and obscure.

*FEMALE*.—Unless otherwise indicated, measurements are based on seven individuals. Essentially like the male in all details but much larger in actual size of body and appendages, appendages frequently a little stouter. Body length 0.9–1.15 mm.; carapace 0.31–0.33 mm. long, 0.29–0.35 mm. wide; abdomen usually 0.6–0.8 mm. long and 0.3–0.45 mm. wide.

*Chelicera*.—As in the male; length 0.22–0.245 mm., width of base 0.13–0.15 mm.; movable finger, fig. 18A, between 0.135 and 0.15 mm. long; serrula exterior with 14 ligulate plates.

*Palp*.—As in the male. Maxilla usually 0.2–0.22 mm. long, about one-half as wide as long; trochanter 0.125–0.135 mm. long, 0.068–0.076 mm. wide, length 1.73 to 1.85 times the width; femur 0.25–0.27 mm. long, 0.072–0.08 mm. wide, length 3.4 to 3.5 times the width; tibia 0.15–0.156 mm. long, 0.09–0.093 mm. wide, length 1.67 to 1.71 times the width; chela 0.42–0.44 mm. long, 0.11–0.18 mm. wide, length 3.68 to 3.89 times the width; chelal hand 0.158–0.168 mm. long, 0.11–0.118 mm. deep, the depth equal to the width; movable finger 0.275–0.295 mm. long.

*Legs*.—As in the male. Measurements based on four individuals. First leg with trochanter 0.074–0.079 mm. long, length 1.18 to 1.27 times the depth; pars basalis 0.133–0.145 mm. long, 2.95 to 3.05 times the depth; pars tibialis 0.076–0.078 mm. long, length 1.68 to 1.81 times the depth; tibia 0.087–0.095 mm. long, 2.5 to 2.7 times the depth; tarsus 0.132–0.145 mm. long, length 4.35 to 5.4 times the depth, usually under 4.6 times the depth. Fourth leg, fig. 18B, with pars basalis 0.1–0.11 mm. deep; pars tibialis 0.09–0.1 mm. deep; entire femur 0.24–0.25 mm. long, length 2.15 to 2.3 times the depth; tibia 0.17–0.18 mm. long, length 3.1 to 3.25 times the depth; metatarsus 0.072–0.076 mm. long, 1.65 to 1.75 times the depth; telotarsus 0.13–0.14 mm. long, length 4.25 to 4.4 times the depth.

**Genital Complex.**—Posterior genital operculum with seven or eight acuminate setae; anterior operculum with four setae on each side anterior and laterad to the genital aperture and two additional setae just anterior to the pore.

**Holotype, male.**—Herod, Illinois: April 18, 1944, Ross & Sanderson.

**Allotype, female.**—Same data as for holotype.

**Paratypes.**—Illinois.—Same data as for holotype, 8♂, 59♀. HEROD: ground cover

ana. Hagen's description, although insufficient to permit an accurate generic placement, indicates characters that provide means for the separation of this unplaced species from other northeastern species of Chthoniini, as given in the key. The types of this species appear to have been lost, being neither in the U. S. National Museum nor among the types of Hagen's other species at the Museum of Comparative Zoology, and I have seen no material of the species. Since caves occur in Illinois, it is possible that this form may be found in the state.

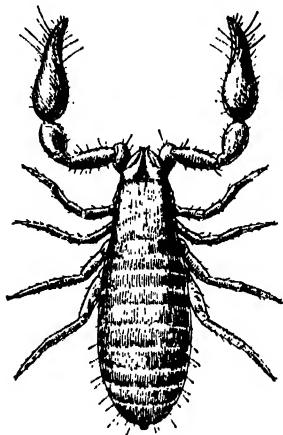


Fig. 19.—*Microbisium confusum* ♀. An example of the suborder Diplosphyronida and the family Neobisiidae.

in woods, Oct. 12, 1933, Frison & Ross, 1♂, 3♀. FOUNTAIN BLUFF: March 18, 1942, Ross & Sanderson, 1♀. LAKE GLENDALE: ground cover, March 17, 1943, Ross & Sanderson, 1♂, 4♀; 1♂, 1♀ (CH). LA RUE: ground cover, April 19, 1944, Ross & Sanderson, 2♀ (NHS). THEBES: ground cover, April 19, 1944, Ross & Sanderson, 5♀.

There are two records in addition to the type series. DIXON SPRINGS: March 7, 1945, Ross & Sanderson, 1 specimen. VIENNA: debris in woods, Jan. 25, 1947, B. D. Burks, 5 specimens.

This species is dedicated to Dr. Milton W. Sanderson of the Illinois Natural History Survey staff.

## UNPLACED SPECIES

### 6. *Genus? packardii* Hagen

*Blothrus packardii* Hagen (1879, p. 399).

*Chthonius packardii* Banks (1895, p. 13).

This species was described from material collected from caves in Kentucky and Indi-

## Suborder DIPLOSPHYRONIDA

In North America, and with rare exception elsewhere, members of this suborder may be recognized by the presence of the divided tarsus of each leg.

### KEY TO SUPERFAMILIES

- Movable finger of chelicera toothed along at least one-fifth of inner margin, fig. 25C.....  
.....**Neobisioidea**, p. 443
- Movable finger of chelicera with either a single tooth or with a small group of teeth at apex of inner margin, fig. 27D.....  
.....**Garypoidea**, p. 446

## Superfamily NEOBISIOIDEA

Species belonging to this superfamily have the movable finger of the chelicera toothed on the inner margin; the plates of the scutula interior are not fused; and the subterminal setae of the pedal telotarsus are seldom simple. A single family, Neobisiidae, is present in our immediate fauna but two other families, Syarinidae and Ideoroncidae, have a very limited number of genera and species in the Rocky Mountain region and in California.

### KEY TO FAMILIES

1. Venom apparatus developed in both fixed and movable chelal fingers.....  
.....**Ideoroncidae**  
Venom apparatus developed only in the fixed finger, fig. 24.....2
2. Pleural membrane of abdomen smoothly and longitudinally plicate, never granulate; suture between pars basalis and pars tibialis of femur IV at least slightly oblique to the long axis of the femur...  
.....**Syarinidae**  
Pleural membrane of abdomen granulate or granulo-striate; suture between parts

of femur IV truly perpendicular to the long axis of the femur....*Neobisilidae*

### IDEORONCIDAE

The genus *Albiorix* Chamberlin is reported from the southwestern part of the United States. A key to the species of the genus is given by Hoff (1945e).

### SYARINIDAE

This family is represented in the American fauna north of Mexico by one genus, *Syarinus* Chamberlin, with a limited number of species in the Rocky Mountain and Pacific Coast areas and by two very restricted genera, *Hyarinus* Chamberlin and *Chitra* Chamberlin, in California.

### NEOBISIIDAE

Members of this family are identified by the presence of a venom apparatus only in the fixed finger, by the granulate nature of the pleural membranes, and by the vertical suture between the pars basalis and pars tibialis of the third and fourth legs. One subfamily is represented in Illinois, and a second is known from Arkansas.

#### KEY TO SUBFAMILIES

- Cheliceral galea present, at least almost as long as the apical tooth and having one or more branched processes, fig. 23.....*Ideobisilinae*
- Cheliceral galea wanting or represented by no more than a sclerotic knob, fig. 25C.....*Neobisilinae*

#### Subfamily IDEOBISIINAE

While this subfamily has not been reported from Illinois, it is possible that, with further collecting, members of the genus *Microcrea-gris* may be found in the state.

#### 7. MICROCREAGRIS Balzan

*Microcrea-gris* Balzan (1891, p. 543). Genotype, monobasic: *Microcrea-gris gigas* Balzan.

This genus, figs. 22, 23, may be separated from the other genera of the subfamily by the way in which the tactile setae *t*, *st*, and *sb* are scattered on the movable chelal finger rather than clustered submedially. There is a single simple or branched galea.

This genus is not reported from Illinois,

but *oxarkensis* Hoff (1945a) has been described from Arkansas, and it is expected that this or related species of *Microcrea-gris* may eventually be found in Illinois.

#### Subfamily NEOBISIINAE

This subfamily forms a coherent group of forms in which the galea is either wanting or greatly reduced and represented by no more than a sclerotic knob. A single genus is recorded from Illinois. A second genus, *Neobisium* Chamberlin, is included here since it has been reported from Tennessee.

#### KEY TO GENERA

- Four long tactile setae present on movable chelal finger and eight on fixed chelal finger, fig. 20.....8. *Neobisium*
- Three long tactile setae present on movable, and seven on fixed, chelal finger, fig. 25B.....9. *Microbisium*

#### 8. NEOBISIUM Chamberlin

*Neobisium* Chamberlin (1930, p. 11). Genotype, by original designation: *Obisium muscorum* Leach.

The genus, figs. 20, 21, can be recognized by the character given in the key, by the presence of tactile setae *et*, *est*, and *it* on the distal third rather than the distal fourth or fifth of the fixed chelal finger, and by the no more than moderately slender legs and palp.

To date this genus has not been reported from Illinois but is represented by several species occurring in the southeastern states. One of these, *tenuis* Chamberlin, has been taken in Tennessee and there is a possibility that it or one of its congeners may ultimately be found in Illinois.

Chamberlin (1930) described *tenuis* as a variety of *carolinensis* (Banks 1895). On the basis of differences pointed out by Chamberlin in the original description of *tenuis*, it seems probable that this form should have specific rather than varietal status. The typical form of *carolinensis* is found in Georgia and North Carolina, while *tenuis* is confined to the mountain area of eastern Tennessee. Because of its habitat, *tenuis* is hardly to be expected in our fauna.

#### 9. MICROBISIUM Chamberlin

*Microbisium* Chamberlin (1930, pp. 10, 20).

Genotype, by original designation: *Obisium brunneum* Hagen.

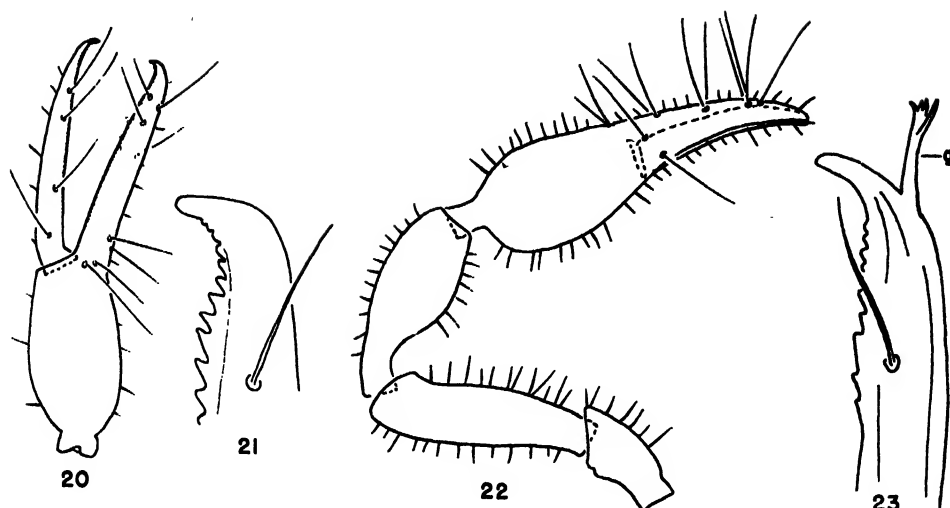


Fig. 20.—*Neobisium carolinensis tenuis* ♂. Lateral view of chela.

Fig. 21.—*Neobisium carolinensis tenuis* ♂. Distal part of movable cheliceral finger.

Fig. 22.—*Microcreagris ozarkensis* ♂. Dorsal view of palp.

Fig. 23.—*Microcreagris ozarkensis* ♂. Distal half of movable cheliceral finger; *g*, galea.

Members of this genus are peculiar in that the number of tactile setae of the chelal fingers is reduced to three setae on the movable finger and seven setae on the fixed finger, fig. 25B. Males have not been found in this genus.

Three species are placed in the genus, two eastern ones treated below, and a third, *parvulum* (Banks), from the southwestern states. These are treated by Hoff (1946e).

#### KEY TO SPECIES

- Palpal femur less than 0.4 mm. long, length between 2.42 and 2.89 times the width....  
*confusum*  
 Palpal femur more than 0.4 mm. long, length between 2.87 and 3.2 times the width....  
*brunneum*

#### *Microbisium brunneum* (Hagen)

*Obisium brunneum* Hagen (1869, p. 52).

*Microbisium brunneum* (Hagen). Chamberlin (1930, p. 20), Hoff 1946e, p. 494.

*Microbisium brunneum* (Hagen), in part. Hoff (1944a, p. 125; 1946b, p. 109).

This species is readily identified by characters indicated in the key. An extensive re-description of the species is given by Hoff (1946e).

**DISTRIBUTION.**—*Microbisium brunneum* has a wide geographic range in eastern Canada and in northern United States from New York to Illinois. In Illinois its distribution is markedly discontinuous. It has

been taken in 14 collections from Lake County in the northeastern corner of the state and in 1 collection each from Alexander and Pulaski counties, both in the extreme southern tip of the state. All collections of this species from Lake County were made from tamarack bogs. Of the collections from the southern tip of the state, one was taken from "dry forest" in the Horseshoe Lake Game Refuge near Olive Branch and the other was from "humus and soil from drier part of bank, cypress bottoms" near Karnak. The distribution seems to indicate that *brunneum* is associated with acid soil and water and with deciduous coniferous trees in Illinois associated with either tamarack or cypress.

**Illinois Records.**—About 200 adults and nymphs of all sizes from several localities. ANTIOCH: sphagnum moss in tamarack bog, Oct. 15, 1942, and Oct. 27, 1943, Ross & Sanderson. KARNAK: humus and soil from drier part of bank, cypress bottoms, Feb. 24, 1933, Ross & Mohr. OLIVE BRANCH: Horseshoe Lake Game Refuge, dry forest, Dec. 2, 1943, Frison & Ayars. VOLO: sphagnum moss in tamarack bog, Oct. 7, 1933, J. Alsterlund; sphagnum moss in tamarack bog, Oct. 27, 1943, Ross & Sanderson. WAU-CONDA: ground cover in tamarack bog, March 16, 1933, Frison & Mohr; tamarack bog, ground cover, Oct. 20, 1943, Ross & Sanderson.

*Microbisium confusum* Hoff

*Microbisium brunneum* Hoff (non Hagen), in part (1944a, p. 125; 1946b, p. 109). Misidentification.

*Microbisium confusum* Hoff (1946e, p. 496).

Identification of this species can be made by the characteristics given in the key and illustrated in figs. 19, 25A, 25B. In addition to the scheme indicated in the key, the following will help in separating *brunneum* and *confusum*. *M. confusum* shows the following average differences when compared with *brunneum*: the body is smaller; the palp is smaller, less sclerotized, less deeply colored, and less polished; the palpal femur is conspicuously smaller and stouter; the pedicle of the tibia is commonly less slender and the inner margin of the palpal tibia is usually more evenly rounded or convex; and the chelal fingers appear stouter when viewed from the dorsum. Additional descriptive material is contained in the original description (Hoff 1946e).

**DISTRIBUTION.**—*Microbisium confusum* appears to be the common species of the genus in the Mississippi River valley and the eastern United States. In Illinois it is the most widely distributed and most abundant species of all the pseudoscorpions and has been taken in 148 collections from all parts of the state. It occurs in forest soil and litter, and in decayed logs or stumps. The species is found associated with *brunneum* in the tamarack bogs of northeastern Illinois.

**Illinois Records.**—Many adults and nymphs taken during all months of the year

are from Adams County, Alhambra, Alto Pass, Antioch, Apple River Canyon State Park, Astoria, Aurora, Bensenville, Brownfield Woods, Browning, Burksville, Burton, Cadiz, Caledonia, Charleston, Clarksville, Collinsville, Cook County, Danville, Dixon Springs, Dolson, Elgin, Enfield, Fountain Bluff, Fox Ridge State Park, Freeport, Galena, Geff, Giant City State Park, Grafton, Halfday, Havana, Herod, Highland Lake (near Grays Lake), Ivanhoe, Kampsville, Kell, Kellerville, La Grange, Lake Glendale, Lake Zurich, La Rue, Lincoln, Logan, Magnolia, Makanda, Marshall, Mascoutah, Mason County, Monticello, Mound City, New Windsor, Oakwood, Palestine, Palisades State Park, Paloma, Palos Park, Peoria, Pocahontas, Quincy, Ruma, Seymour, Sherman, Siloam, (Siloam Springs), Starved Rock State Park, Summit, Troy, Urbana, Ursa, Vienna, Volo, Wauconda, Waukegan, White Pines Forest State Park, Winthrop Harbor, Zion.

## Superfamily GARYPOIDEA

Members of this superfamily are characterized as follows: the movable cheliceral finger, instead of being toothed on the inner margin, bears a simple, or occasionally a subdivided, subterminal lobe; the plates of the serrula interior are fused basally to form a velum and only the terminal teeth are free; the subterminal setae of the telotarsi are always simple and acute. Three families are represented in the United States but only one, the Garypidae, has representatives in the north-central part of the country.

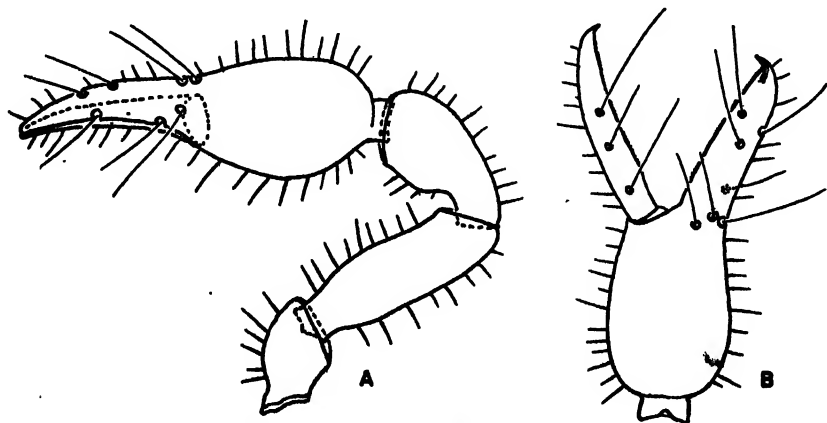


Fig. 24.—*Microbisium brunneum* ♀. A, dorsal view of palp; B, lateral view of chela, poison gland (in fixed finger only) shown by dotted line.

## KEY TO FAMILIES

1. Venom apparatus developed in fixed finger only; at base of reduced or vestigial apical tooth of the movable finger is a groove, the receptor venedentis, into which fits the tooth or venedens of the fixed finger. . . . . **Menthidae**  
Venom apparatus developed in both fixed and movable fingers; movable finger without receptor venedentis. . . . . 2
2. Pleural membrane smoothly and evenly plicate; carapace usually not triangular; coxal area never widened posteriorly; setae of palpal femur and tibia conspicuous, always slender and acute. . . . . **Olpiidae**  
Pleural membrane not smoothly and evenly plicate; carapace definitely triangular in shape, fig. 27C; coxal area with few exceptions much widened posteriorly; setae of the palpal femur and tibia short and inconspicuous; if acute, these setae are very short. . . . . **Garypidae**

**MENTHIDAE**

This family is represented in America north of Mexico by a single genus, *Menthus* Chamberlin, a few species of which occur in California.

**OLPIIDAE**

The family contains a few genera and species confined in the United States chiefly to the arid and semiarid regions of the Southwest.

**GARYPIDAE**

This family is characterized by a venom apparatus in each of the chelal fingers; investing setae of palpal femur and tibia short and inconspicuous; pleural membranes granular or with rugose striations, not evenly striated; carapace subtriangular; abdomen broader than the cephalothorax. A single genus occurs in central and eastern United States. The only other nearctic genus, *Garypus*, is represented by a few species in California and doubtful records from Florida.

**10. LARCA Chamberlin**

*Larca* Chamberlin (1930, p. 609). Genotype, by original designation: *Garypus latus* Hansen.

This genus, fig. 26, contains species in which the arolia are longer than the terminal

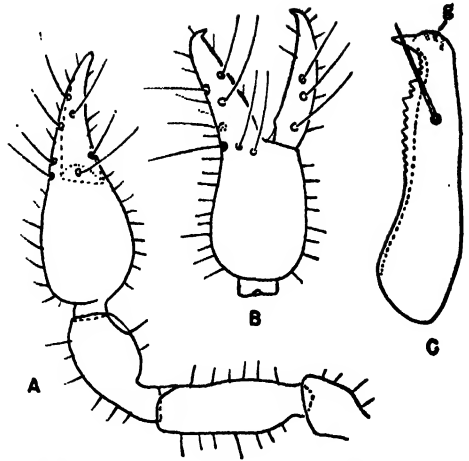


Fig. 25.—*Microbisium confusum* ♀. A, dorsal view of palp; B, lateral view of chela; C, chelicera, movable finger; g, knoblike galea, showing silk ducts. A and B same scale as fig. 24.

claws of the pedal tarsi; the movable chelal finger has two tactile setae; pars basalis of legs I and II is never much longer than the pars tibialis; the femoral articulation of the first two pairs of legs is only slightly mobile; the investing setae of the palps are decidedly lanceolate. Only the following species of this genus is known to occur in North America.

*Larca granulata* (Banks)

*Garypus granulatus* Banks (1891, p. 163).

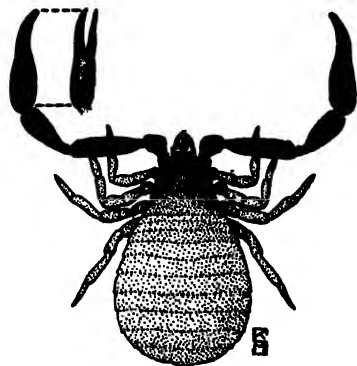


Fig. 26.—*Larca granulata*. An example of the suborder Diplosphyronida and the family Garypidae. The division of the tarsus into metatarsus and telotarsus is so obscure and weak that it is not discernible in the figure.

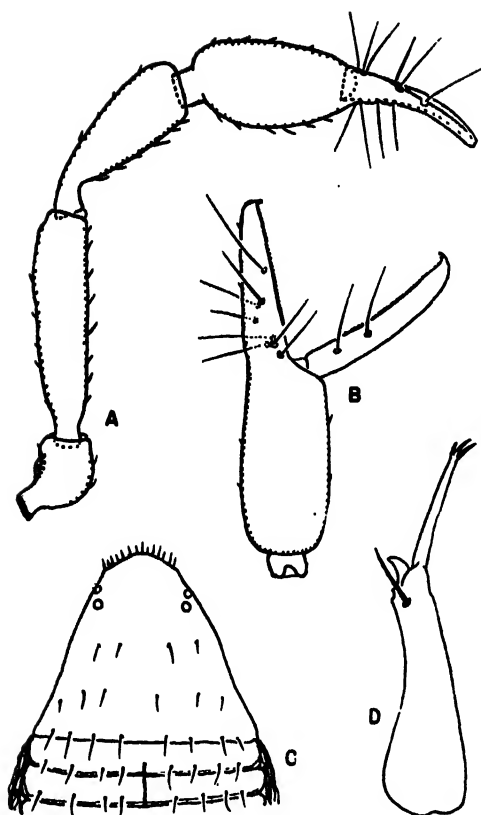


Fig. 27.—*Larca granulata* ♀. A, dorsal view of palp; B, lateral view of chela; C, dorsal view of carapace; D, chelicera, movable finger.

*Larca granulata* (Banks). Chamberlin (1930, p. 616), Hoff (1946b, p. 109).

*Chernes dentatus* Ross (*non* Banks), (1944, fig. 56). Misidentification.

Individuals of this species are easily recognized by the family characteristics, since this is the only garypid pseudoscorpion in the state. For sight recognition, the following characters are useful: the stout abdomen in which the width is nearly equal to the length, the triangular carapace, and the slender form of the palpal segments, fig. 27A.

The following measurements are given for a more detailed check of identifications. They were taken from a female mounted in Canada balsam: body length 2.1 mm.; carapace 0.6 mm. long, 0.8 mm. wide across the posterior margin; abdomen 1.5 mm. long, 1.3 mm. wide; palpal trochanter 0.3 mm. long, 0.17 mm. wide; femur 0.66 mm. long, 0.163 mm. wide; tibia 0.57 mm. long,

0.185 mm. wide; chela exclusive of pedicle 0.85 mm. long, 0.247 mm. wide; depth of chelal hand 0.215 mm., length 0.44 mm.; movable chelal finger 0.44 mm. long. First leg with pars basalis 0.235 mm. long, 0.09 mm. deep; pars tibialis 0.175 mm. long, 0.103 mm. deep; tibia 0.215 mm. long, 0.075 mm. deep; metatarsus 0.15 mm. long, 0.055 mm. deep; telotarsus 0.14 mm. long, 0.045 mm. deep. Fourth leg with entire femur 0.49 mm. long, 0.133 mm. deep; tibia 0.37 mm. long, 0.088 mm. deep; metatarsus 0.18 mm. long, 0.065 mm. deep; telotarsus 0.175 mm. long, 0.05 mm. deep.

In the Illinois collections are several nymphs of two sizes. Since the determination of which nymphal stages are represented is questionable, it is desirable to wait for descriptions until all three nymphal stages are available for study.

**DISTRIBUTION.**—This species occurs in the central and northeastern United States. No collections have been taken in Illinois in addition to those previously recorded (Hoff 1946b) from Starved Rock State Park (La Salle County) and Fountain Bluff (Jackson County).

The species is found chiefly in debris and moss on sandstone ledges.

**Illinois Records.**—**FOUNTAIN BLUFF:** March 18, 1942, Ross & Sanderson, 3 adults. **STARVED ROCK STATE PARK:** mossy debris on shelves, sandstone bluff, Nov. 8, 1943, Ross & Sanderson, 5 adults, 4 nymphs.

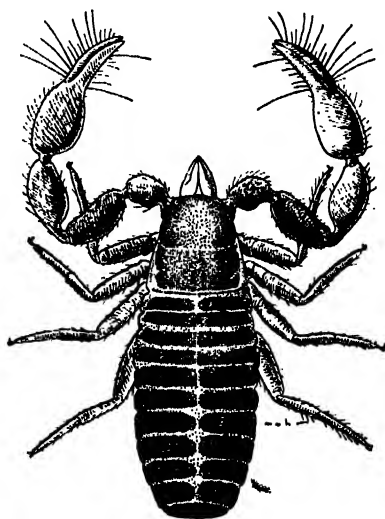


Fig. 28.—*Pselaphochernes parvus*. An example of the suborder Monosphyronida and the family Chernetidae.

## Suborder MONOPHYRONIDA

Pseudoscorpions of this suborder have only a single tarsal segment on each leg. Three superfamilies are recorded from America north of Mexico, only one of which is represented in the north-central part of the United States.

## KEY TO SUPERFAMILIES

1. With four prominent eyes. . . . . **Feaelloidea**  
With two eyes or none, never with four. . . . . 2
2. Femora of legs I and II similar to those of legs III and IV, with the same type of articulation. . . . . **Cheiridioidea**  
Femora of legs I and II each with a more or less distinct membranous articulation between pars basalis and pars tibialis, the apex of the pars basalis often enlarged, and the less deep base of the pars tibialis frequently appears to fit into it, fig. 44A; femora of legs III and IV with pars basalis and tibialis more or less fused solidly, about the same length where they join, the fusion being a somewhat straight suture, fig. 44B. . . . . **Cheliferoidea**

## Superfamily FEALLOIDEA

The nearctic fauna of this superfamily contains only the family Pseudogarypidae, represented in North America by a single genus, *Pseudogarypus* Ellingsen. This genus has only a few species and is restricted to the Rocky Mountain and the Pacific Coast areas.

## Superfamily CHEIRIDIOIDEA

Two families are represented in the fauna of America north of Mexico, but neither is found in Illinois.

## KEY TO FAMILIES

- Venom apparatus developed only in fixed chelal finger; femoral articulations of legs lacking or vestigial so that the pars tibialis and the pars basalis appear to be fused into one. . . . . **Cheiridiidae**
- Venom apparatus developed in both chelal fingers; femoral articulations of legs well developed. . . . . **Sternophoridae**

**CHEIRIDIIDAE**

This family is represented in America north of Mexico by a few species of the genus *Apocheiridium* Chamberlin, found only on the west coast of the United States.

## STERNOPHORIDAE

Representatives of this family are found in western Mexico, southern United States, and Australia (Chamberlin 1931a). Two genera, one of which is of uncertain status, have been placed in the family. A limited number of species of the genus *Sternophorus* Chamberlin are known from southern and southwestern United States and one species of the genus *Garyops* Banks has been reported from Florida. The genus *Garyops* is inadequately described and *Sternophorus* may eventually prove to be a synonym.

## Superfamily CHELIFEROIDEA

Members of this superfamily always have the femora of the first and fourth legs structurally dissimilar; eyes two or none. The group is represented in America north of Mexico by three families, two of which have representatives in our area.

## KEY TO FAMILIES

1. At least a few accessory teeth present on chelal fingers, figs. 32D, 34B, 36A; venom apparatus well developed in movable finger only, but may be present as a vestige in the fixed finger. . . . . **Chernetidae**, p. 449  
No accessory teeth present on chelal fingers, figs. 49C, 50C, 51C; venom apparatus not as above. . . . . 2
2. Venom apparatus developed in fixed finger only; terminal venom tooth of fixed finger structurally much more prominent than terminal tooth of movable finger. . . . . **Atemnidae**, p. 485  
Venom apparatus developed equally well in both fixed and movable fingers, fig. 51C; terminal teeth of both fingers equal in size, or nearly so. . . . . **Cheliferidae**, p. 485

**CHERNETIDAE**

Both nearctic subfamilies of this family are known from Illinois. In use of the following key for their separation, great care must be exercised because the tactile seta of the fourth pedal tarsus is often broken or lost.

## KEY TO SUBFAMILIES

Setae of body and palps long and acuminate; when present, the tactile seta of the fourth pedal tarsus is located considerably proximad



from the mid-point of the segment.....

.....**Lamprochernetinae**  
At least some of the setae of body and palps  
denticulate, well feathered, or plumose, often  
appearing club shaped, figs. 36A, 37D, 46;  
when present, the tactile seta of the fourth  
pedal tarsus is located near the middle or  
distad from the middle of the segment.....  
.....**Chernetinae**

### Subfamily LAMPROCHERNETINAE

This subfamily is characterized by a straight or slightly convex posterior carapacic margin; the setae on the body and palps are long and acuminate; and, when present, the tactile seta of the tarsus of the fourth leg is inserted near the base of the tarsus. Only two genera are recorded from America north of Mexico. One genus, *Lamprochernes* Tömösváry, is found in the eastern and central parts of the United States. From California and Florida is reported the other genus, *Lustrochernes* Beier, which contains chiefly species that are of uncertain position because of inadequate descriptions.

#### 11. LAMPROCHERNES Tömösváry

*Lamprochernes* Tömösváry (1882, p. 185).

Genotype by subsequent designation of Beier (1932c, p. 82): *Chelififer nodosus* Schrank.

*Lamprochernes* Tömösváry. Beier (1932c, p. 82).

The genus *Lamprochernes* is characterized by the absence of an accessory tooth on the tarsal claws of the legs and by the position of the tactile setae of the fixed chelal finger, it always being clearly farther from the finger tip than *ist* is from *isb*. Four nearctic species are known: *ellipticus* Hoff (1944b) from Mexico, *grossus* (Banks) from Colorado, and the two following.

#### KEY TO SPECIES

Hand of chela subquadrate in dorsal view, subtruncate at base, fig. 30A; chela exclusive of pedicle usually less than 0.8 mm. long, length 2.4 to 2.6 times the width. **oblongus**  
Hand of chela subovate, basal margin somewhat rounded, fig. 29A; chela exclusive of pedicle more than 0.8 mm. long, length 2.8 to 3.0 times the width.....**minor**

#### *Lamprochernes oblongus* (Say)

*Chelififer oblongus* Say (1821, p. 64).

*Chelififer* (*Lamprochernes*) *oblongus* (Say).  
Ellingsen (1909, p. 368).

*Chelanops oblongus* (Say). Ewing (1911, p. 79).

*Lamprochernes oblongus* (Say). Beier (1932c, p. 84).

Since the type specimens deposited by Say in the Philadelphia Academy have apparently been lost, a neotype has been selected and deposited in the collection of the Illinois State Natural History Survey. A detailed description is given here of *oblongus* because no description is available in the literature except the very brief diagnosis given by Beier (1932c). Beier's diagnosis is possibly based on specimens from Pennsylvania reported by Ellingsen (1909) as being deposited in the Berlin Museum. Illinois specimens of this species agree well with Beier's description except that our specimens usually have slightly more slender chelae. This difference was noticed also in specimens from Arkansas and Georgia as previously reported (Hoff 1945a).

Ewing (1911) reported material from Marshall, Champaign, and Muncie, Illinois, under the name *Chelanops oblongus*. His material from Marshall, deposited in the Museum of Comparative Zoology, has been re-examined, but his specimens from the other localities were not available for study.

**MALE.**—The following measurements and ratios are based on three males, including the neotype. Body slender and elongate; light brown in color with palps a deeper reddish-brown; length of body 1.75–2.1 mm. Carapace widest near the middle, a little narrower across the posterior margin; 8 or 10 setae along the posterior carapacic margin; two transverse furrows, the median one deeper than the posterior one; weak eye spots, hardly discernible in specimens treated in caustic; surface of carapace almost smooth; length of carapace 0.6–0.65 mm., greatest breadth 0.45–0.53 mm., posterior breadth 0.45–0.53 mm., ocular width usually about 0.32 mm. Abdomen subcylindrical, slender; tergites, except the first two to four and the eleventh, well divided; surface with very weakly developed scalelike sculpturing; tergal chaetotaxy ranging from about 10 setae on tergite I to as many as 8 or 10 setae on each tergal half in the central and posterior part of the abdomen. Sternites, except XI, weakly divided; usually eight or nine setae in each sternal half but only three or four marginal setae on each half of sternite IV; sternites with color and sculpturing much as on the ter-

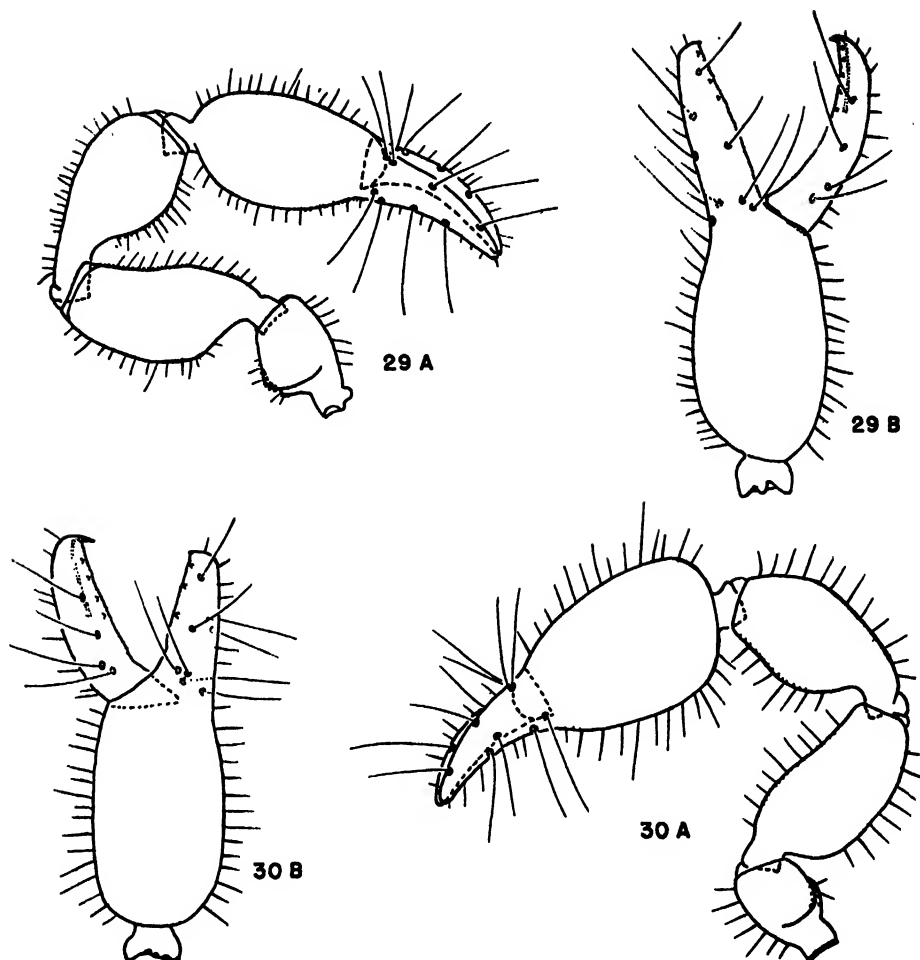


Fig. 29.—*Lamprochernes minor*, holotype ♂. A, dorsal view of palp; B, lateral view of chela.

Fig. 30.—*Lamprochernes oblongus*, neotype ♂. A, dorsal view of palp; B, lateral view of chela.

gites; each stigmatic plate with three setae; abdomen 1.2–1.5 mm. long, 0.5–0.7 mm. wide.

**Chelicera.**—Fig. 8. Yellow in color; fingers relatively slender; flagellum of three setae, of which the one farthest anteriad is unilaterally serrate along the distal one-half; basal and subbasal setae relatively short, each with a few very minute, subterminal denticulations; hand of chelicera with netlike sculpturing on the anterior or dorsal aspect; length of chelicera 0.17–0.19 mm., width of base 0.1–0.11 mm. Fixed finger slender; inner aspect of apical tooth with three denticles; inner finger margin with four or five teeth, of which the two

or three basal ones are very weakly developed; serrula interior with the four distal plates free. Movable finger straight; subapical lobe stout, well developed, and located very close to the base of the apical tooth; apical tooth with a tendency to form two or three poorly developed terminal cusps; galeal seta not reaching to the tip of the galea; galea long, slender, usually with six simple rami in the distal one-half; serrula exterior of 17 to 18 ligulate plates; length of movable finger 0.145–0.16 mm.

**Palp.**—Fig. 30A. Stout, usually deep reddish-brown in color, occasionally lighter; setae fairly numerous, long, appearing acuminate but usually with one to a few

minute, subterminal spinules; surface of segments smooth except for minute granules on the flexor surface of the femur, on the flexor surface and the protuberances of the trochanter, on the flexor surface of the tibia, and usually on the inner surface of the chelal hand near the finger base. Maxilla with ventral face subtriangular in outline; length about 0.3 mm. Trochanter with both sublateral and subdorsal protuberances little elevated; length of trochanter 0.27–0.31 mm., 1.8 to 1.9 times the width in strict dorsal view. Femur with pedicle a little wider than long, well separated from the rest of the segment; flexor margin S-shaped, extensor margin flatly convex in the central portion; length measured along the extensor margin 0.41–0.45 mm., 2.0 to 2.1 times the maximum width; over-all or greatest length 0.45–0.48 mm., 2.2 to 2.3 times the width; width between 0.195 and 0.215 mm. Tibia with a pedicle about as long as wide; tibia much swollen and globose beyond the pedicle; length 0.415–0.465 mm., width 0.21–0.24 mm., length 1.9 to 2.0 times the width. Chela viewed from dorsum with hand heavy and somewhat subquadrate; fingers stout and a little curved; hand basally subtruncate; length of chela without pedicle 0.69–0.77 mm., width 0.27–0.315 mm., length 2.4 to 2.6 times the width; chelal hand without the pedicle 0.4–0.43 mm. long, depth usually less than the width and between 0.24 and 0.31 mm.; movable chelal finger 0.3–0.36 mm. long. Viewed laterally, fig. 30B, chelal hand subquadrate, dorsal and ventral margins weakly convex, basal margin well rounded and not subtruncate; fingers stout; the fixed finger nearly straight, the movable finger slightly curved; movable finger conspicuously shorter than the hand without the pedicle. Marginal teeth of fingers cuspid, conical, and contiguous; usually 25 to 30 teeth on each finger; in most specimens, from 2 to 4 (rarely only 1) accessory teeth in each row, with the greater number in the external row of each finger. Tactile setae arranged as in fig. 30B.

*Legs.*—Yellow in color, often with an orange tinge; segments stout; surface often marked by netlike or scalelike markings. First leg with trochanter 0.1–0.12 mm. long, length 1.1 to 1.25 times the depth; pars basalis 0.1–0.11 mm. deep; pars tibialis 0.105–0.125 mm. deep, both margins evenly convex; entire femur 0.3–0.35 mm. long, 2.7 to 2.9 times the depth; tibia weakly

S-shaped, 0.23–0.26 mm. long, 0.075–0.085 mm. deep, length 3.0 to 3.1 times the depth; tarsus subcylindrical in outline, about 0.2 mm. long, 0.05–0.055 mm. deep. Fourth leg with both margins of the femur evenly and weakly convex, 0.41–0.47 mm. long, 0.145–0.167 mm. deep, length 2.7 to 2.8 times the depth; tibia 0.31–0.355 mm. long, length 3.3 times the depth; tarsus subcylindrical, 0.23–0.27 mm. long, 0.06–0.068 mm. deep, length 3.7 to 4.0 times the depth; tactile seta of the tarsus removed from proximal margin by 0.06–0.08 mm.

*Genital Complex.*—Posterior operculum with 8 to 10 setae arranged chiefly in a row along the margin and with 4 to 6 setae on the posterior rim of the aperture. Anterior operculum with 18 to 24 scattered setae.

*FEMALE.*—Measurements and ratios based on three individuals. Almost identical in detail with the male; body length 2.35–2.5 mm.; carapace 0.62–0.68 mm. long, 0.49–0.53 mm. wide; abdomen 1.7–1.85 mm. long, 0.75–0.9 mm. wide.

*Chelicera.*—No sexual dimorphism exhibited; length of chelicera 0.185–0.2 mm., base 0.105–0.115 mm. wide; movable finger 0.155–0.17 mm. long.

*Palp.*—In general as in male; trochanter 0.3–0.31 mm. long, about 0.17 mm. wide; femur with extensor margin 0.43–0.45 mm. long, greatest length 0.475–0.5 mm., width 0.2–0.22 mm.; tibia 0.45–0.48 mm. long, 0.23–0.24 mm. wide; chela without pedicle 0.75–0.8 mm. long, 0.3–0.305 mm. wide; chelal hand without pedicle 0.42–0.44 mm. long, 0.25–0.28 mm. deep; movable finger 0.35–0.38 mm. long.

*Legs.*—As in the male. First leg with entire femur 0.33–0.355 mm. long, 0.12 mm. deep across the pars tibialis; tibia 0.25–0.26 mm. long, 0.08–0.085 mm. deep; tarsus 0.205–0.235 mm. long, 0.055–0.057 mm. deep. Fourth leg with entire femur 0.45–0.48 mm. long, depth across the pars tibialis 0.165–0.168 mm.; tibia 0.335–0.355 mm. long, 0.1–0.105 mm. deep; tarsus 0.24–0.275 mm. long, 0.065–0.072 mm. deep; tactile seta of tarsus between 0.055 and 0.075 mm. from the proximal margin.

*Genital Complex.*—Usually 8 to 10 setae in a marginal row along the posterior operculum; anterior operculum with 6 to 8 setae posteriad to a compact median group of 10 to 14 setae.

*Neotype, male.*—Havana, Illinois, duff in forest, Nov. 9, 1943, Ross & Sanderson.

**DISTRIBUTION.**—This species is widespread east of the Great Plains area. In all, 14 collections of *oblongus* have been identified from scattered localities over Illinois. Almost invariably, this species is taken from under the bark of oak logs and stumps, as indicated both by Ewing's collections and by the present series. Rarely the species is taken from woody debris and even more rarely from ground cover.

**Illinois Records.**—**ASTORIA:** under oak bark, Nov. 1, 1943, Ross & Sanderson, 6 ♀, 1 ♂, 2 nymphs. **AURORA:** Sept. 4, 1939, H. Dybas, 1 ♀ (JC). **BENTON:** May 31, 1945, L. Whitlow, 7 specimens. **ELSAH:** May, 1946, C. L. Remington, 2 ♂ (CR). **GRAND TOWER:** under bark of log, March 18, 1943, Ross & Sanderson, 3 ♀. **HAVANA:** ground cover in forest, Nov. 9, 1943, Ross & Sanderson, 2 ♂. **LYONS** (Cook County): Bemis Woods, under bark of oak log, June 27, 1944, C. L. Remington, 1 ♀. **MARSHALL:** under bark of log, Feb. 6, 1909, H. E. Ewing, 1 specimen (MCZ). **QUINCY:** Coe's Spring, bark removed from old log suspended over stream, Jan. 4, 1943, C. C. Hoff, 1 nymph; south of St. Anthony's Church, under bark of old snag in pasture, July 8, 1944, C. C. Hoff, 1 nymph, 1 ♀ (CH). **SILAM:** Silam Springs, under bark of log, Oct. 8, 1945, C. C. Hoff, 1 ♀ (CH). **URBANA:** Dodson's Woods, under bark of fallen white oak, June 6, 1927, Miller, 1 ♀ (JC). **ZEIGLER:** Oct. 11, 1933, Frison & Ross, 1 ♂.

#### *Lamprochernes minor* new species

This species, figs. 29A, 29B, is readily separated from *oblongus* by the shape of the palpal chela. In many respects, this new species shows much closer affinity to European and North African species than it does to *oblongus*. The closest relationship appears to be with *nodosus* (Schrank) and *chyzeri* Tömösváry. From these two forms, *minor* may be separated by the more granular carapace and differences in the shape of the palpal femur.

**MALE.**—Description based on the male holotype. Body slender, legs moderately stout, palps stout; body and legs light brown in color, the palps deeper brown; length of body 2.18 mm. Carapace rounded anteriorly, sides somewhat convex, widest near the center; two well-marked, transverse furrows, the posterior one very little closer to the posterior carapacic margin than to the median furrow; no eye spots observed; about

10 setae along the posterior carapacic margin; carapace moderately granular except on the dorsal surface anterior to the posterior carapacic furrow; length of carapace 0.71 mm., greatest width 0.51 mm., width across the posterior margin 0.48 mm. Tergites, except I, II, and XI, completely divided; surface with scalelike markings; first tergite with 18 setae, second tergite with 18 to 20 setae, about 12 setae on each half-tergite of the central portion of the abdomen; all setae acuminate. Sternites divided; sculpturing as on the tergites; each fourth sternal half with 11 to 12 setae excluding those associated with the stigmata; each sternal half of the central part of the abdomen with as many as 18 setae. Each anterior stigmatic plate with three setae, each posterior plate with four; pleural membranes marked by numerous parallel striations; abdomen about 1.5 mm. long, width about one-half the length.

**Chelicera.**—Essentially as described above for *oblongus*; serrula exterior with 16 ligulate plates; length of chelicera approximately 0.17 mm., width of base about 0.115 mm., length of movable chelal finger 0.165 mm.

**Palp.**—Fig. 29A. Brownish-orange to golden in color; setae numerous and acuminate to subacuminate, frequently with a few subterminal and terminal spinules; segments stout to very stout; the sides of the maxilla, the entire trochanter, and the inner or flexor surfaces of the femur, tibia, and chela moderately granulate; also weakly granulate on the extensor surface of the chelal hand near the finger base. Maxilla 0.345 mm. long, about 0.21 mm. wide. Trochanter with well-developed subdorsal and sublateral protuberances, the former anterior to the latter; pedicle about as long as wide; trochanter 0.32 mm. long, about 0.2 mm. wide. Femur very stout; inner margin distinctly S-shaped; extensor margin markedly convex; pedicle about as long as wide, a distinct notch near the distal end of the flexor margin; length measured along the extensor margin (but not following the curvatures) 0.52 mm., greatest length 0.56 mm., width 0.24 mm. Tibia club shaped, swollen beyond the pedicle, which is much longer than wide; inner margin evenly convex beyond the pedicle; extensor margin flattened at least in the basal one-half and convex beyond; 0.545 mm. long, 0.248 mm. wide. Chela with the hand suboval in outline, fingers a little curved and fairly stout;

flexor margin of chelal hand moderately convex and extending without interruption into the basal margin; extensor margin less convex but not flatly convex; pedicle about as long as wide; chela, without pedicle, 0.85 mm. long, 0.29 mm. wide; chelal hand, without pedicle, 0.45 mm. long, 0.275 mm. deep; movable finger 0.43 long. As viewed from side, chelal hand, fig. 29B, subovate; fixed finger straight, movable finger curved; fingers gaping when closed; marginal teeth contiguous, cuspid, about 35 on each finger; fixed finger with three external and two internal accessory teeth; movable finger with five external and one internal accessory teeth; nodus ramosus of movable finger about two areolar diameters proximad from tactile seta *t*. Tactile setae placed as shown in the figure.

**Legs.**—First and second legs weakly granulate, granules merging into scalelike sculpturing on the third and fourth legs; setae acuminate, fairly numerous. First leg with pars basalis 0.113 mm. deep; pars tibialis with both margins moderately convex, 0.113 mm. deep; entire femur 0.35 mm. long; tibia very weakly S-shaped, 0.262 mm. long, 0.076 mm. deep; tarsus subcylindrical, 0.225 mm. long, 0.053 mm. deep. Fourth leg with extensor margin of femur evenly convex, flexor margin nearly straight; pars basalis 0.132 mm. deep, pars tibialis 0.165 mm. deep; entire femur 0.49 mm. long; tibia with flexor margin weakly convex, extensor margin nearly straight except at the base, a tactile seta on the extensor margin very near the distal end, tibia 0.38 mm. long, 0.102 mm. deep; tarsus subcylindrical, 0.274 mm. long, 0.07 mm. deep; tactile seta of tarsus located 0.1 mm. from the proximal margin.

**Genital Complex.**—Anterior operculum with 30 scattered setae; posterior operculum with 18 to 20 setae arranged chiefly in a marginal row and with two pairs of setae on the posterior rim of the aperture.

**FEMALE.**—Measurements and ratios based on three individuals, including the allotype. Like the male except as noted below. Each fourth sternal half usually with four setae. All tergites except the eleventh frequently divided. Body 2.0–2.5 mm. long; carapace 0.65–0.73 mm. long, 0.55–0.6 mm. wide; posterior width between 0.5 and 0.6 mm.; abdomen 1.3–1.85 mm. long, width equal to about one-half the length.

**Chelicera.**—Between 0.18 and 0.19 mm.

long, base between 0.115 and 0.135 mm. wide; movable finger 0.16–0.18 mm. long; serrula exterior with 16 to 18 ligulate plates.

**Palp.**—Maxilla 0.32–0.35 mm. long, 0.22–0.24 mm. wide. Trochanter 0.31–0.355 mm. long, 0.19–0.22 mm. wide, length about 1.6 times the width. Femur 0.48–0.56 mm. in length along the extensor margin, 0.22–0.255 mm. wide, length along the extensor margin about 2.2 times the width; greatest length 0.54–0.6 mm., 2.35 to 2.45 times the width. Tibia 0.515–0.585 mm. long, 0.225–0.27 mm. wide, length 2.15 to 2.3 times the width. Chela without pedicle 0.84–0.93 mm. long, 0.28–0.335 mm. wide, length 2.78 to 2.97 times the width; chelal hand exclusive of pedicle 0.445–0.51 mm. long, depth a little less than the width; movable finger 0.435–0.48 mm. long. Chelal fingers with usually 30 to 35 marginal teeth; 4 to 5 teeth in the external row of accessory teeth on each finger and 1 or 2 in the internal row on each finger. Tactile setae located essentially as in the male.

**Legs.**—Segments of first leg measure as follows: pars basalis 0.11–0.135 mm. deep; pars tibialis 0.107–0.13 mm. deep; entire femur 0.35–0.385 mm. long, 2.85 to 3.18 times the depth; tibia 0.255–0.285 mm. long, 0.074–0.087 mm. deep, length 3.28 to 3.47 times the depth; tarsus 0.22–0.24 mm. long, 0.053–0.059 mm. deep, length 4.08–4.22 times the depth. Fourth leg: pars basalis 0.13–0.152 mm. deep; pars tibialis 0.152–0.177 mm. deep; entire femur 0.49–0.56 mm. long, length 3.12 to 3.22 times the depth; tibia 0.373–0.405 mm. long, 0.1–0.113 mm. deep, length 3.58 to 3.85 times the depth; tarsus 0.277–0.3 mm. long, 0.068–0.07 mm. deep, length 3.95 to 4.07 times the depth; tactile seta of tarsus located 0.085–0.1 mm. from the proximal margin.

**Genital Complex.**—Anterior operculum with 22 to 24 (in one individual, only 17) setae; posterior operculum with a row of 10 setae.

**Holotype, male.**—Urbana, Illinois, March 27, 1938, H. H. Ross.

**Allotype, female.**—Same data as for holotype.

**Paratypes.**—ILLINOIS.—URBANA: Same data as for holotype, 2 ♀. ROCHESTER, Sangamon County, Oct. 3, 1943, H. R. Lowenstam, 1 ♀ (IM).

The Urbana collection was from a rotten log; the Rochester collection, from the underside of a stone slab in a yard.

## Subfamily CHERNETINAE

This subfamily constitutes the most conspicuous and important group in our fauna. A member of the subfamily may be recognized by the straight or evenly convex posterior margin of the carapace; by the many short and either toothed or more or less club-shaped setae of the palps and dorsum of the body; and by the tactile seta of the

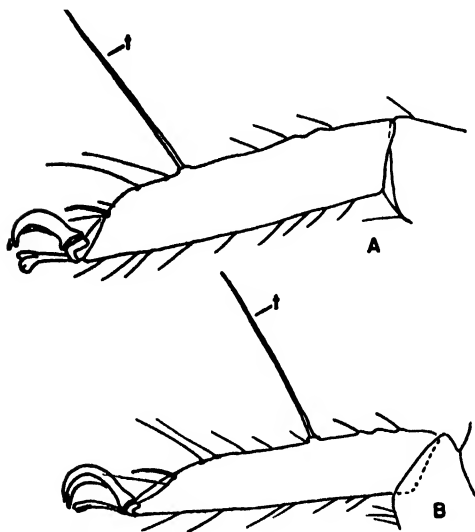


Fig. 31.—Tarsus of fourth leg showing tactile seta, *t*. A, *Parachernes squarrosus* ♂; B, *Pselaphochernes parvus* ♀.

fourth tarsus being located near the middle, or distad from the middle, of the segment.

The present scheme of classification within the subfamily is entirely unstable and unsatisfactory. In order to circumvent confused concepts of some older genera, the writer has established several new ones even though there is a possibility that one or more of these may later lapse into synonymy. A comprehensive revision of the entire subfamily is needed.

In the following key to genera, two points may give the student considerable trouble. The setae on the flagellum of chelicera, mentioned in couplet 8, are often difficult to distinguish, and therefore observations should be made of several specimens wherever possible. Great care must be taken with respect to identification of the tactile seta of the fourth pedal tarsus mentioned in couplet 12, since the seta is easily broken and lost. Also, the seta may be of reduced

size. If it is, there is sometimes confusion over whether or not a true tactile seta is present. A true tactile seta varies from an ordinary seta of the vestiture by having greater length, by being entirely acuminate, and by being directed at more of a right angle to the surface of the segment, fig. 31.

## KEY TO GENERA

1. Cheliceral galea about two-thirds as long as the movable cheliceral finger.....  
.....23. *Genus? corticis*
- Cheliceral galea much less than two-thirds as long as the movable finger of the chelicera.....2
2. Internal surface of chelal hand with a large, projecting, anvil-shaped structure, fig. 45C. Males of.....  
.....21. *Mirochernes*
- Internal surface of chelal hand without such projection.....3
3. All interior setae of fixed chelal finger grouped in the basal portion of the finger, fig. 32E.....12. *Parachernes*
- At least *ist* situated beyond middle of fixed finger.....4
4. Palp slender, palpal femur about four times as long as wide.....  
.....17. *Pseudozaona*
- Palp less slender, moderate to very stout.....5
5. Setae of palp leaflike and bilaterally feathered.....22. *Illinichernes*
- Setae of palp otherwise.....6
6. Tactile seta *st* of movable chelal finger closer to *sb* than to *t*.....  
.....15. *Dendrochernes*
- Tactile seta *st* midway between *sb* and *t* or nearer the latter.....7
7. Tactile seta *ist* of fixed chelal finger on the same level as *est* or a little proximad to *est*.....8
- Tactile seta *ist* distad from *est*.....9
8. Cheliceral flagellum composed of four setae; no tactile seta on fourth pedal tarsus; in our form, the palpal femur and tibia each have a length greater than 0.75 mm.....13. *Chelanops*
- Flagellum composed of three setae; a tactile seta present on fourth pedal tarsus; length of femur and of tibia less than 0.6 mm.....  
.....14. *Pselaphochernes*
9. Setae *b* and *sb* of cheliceral hand thickened and denticulate.....  
.....19. *Hesperochernes*
- Not as above, at least seta *b* acuminate.....10
10. Both seta *b* and seta *sb* of cheliceral hand acuminate.....20. *Acuminochernes*
- Seta *b* of cheliceral hand acuminate, *sb* denticulate.....11
11. Palp with following combination of

characters: length-width ratio of palpal femur about 2.3:1; length of chela exclusive of the pedicle divided by length of femur usually between 1.7 and 1.8; length of chela greater than 1.0 mm.; length of femur more than 0.6 mm.; tactile seta present on tarsus of fourth leg. Females of....21. *Mirochernes*

Some other combination of palpal characters; tactile seta absent from or present on tarsus of fourth leg.....12

12. No tactile seta on tarsus of fourth leg; combination of length-width ratio of femur 2.3-2.5:1 and of chela 2.6-2.75:1.....16. *Reginachernes*

Tactile seta present on tarsus of fourth leg; Illinois species having a similar length-width ratio of both femur and chela (exclusive of pedicle) of palp, either both greater than 2.6, or both less than 2.5.....18. *Dinocheirus*

## 12. *PARACHERNES* Chamberlin

*Parachernes* Chamberlin (1931b, p. 192).

Genotype, by original designation: *Parachernes ronnaii* Chamberlin.

*Parachernes* Chamberlin. Beier (1932c, p. 116).

Members of this genus can be recognized by the grouped condition on the fixed chelal finger of the tactile setae *it*, *ist*, *isb*, and *ib*, with *it* clearly farther from the finger tip than from *isb*, fig. 32E; flagellum of three setae; eye spots mostly present; tergites divided; setae of body and palp toothed or feathered, seldom lightly clavate; tactile seta *st* of movable chelal finger only a little nearer to *sb* than to *t* or standing in the middle between the two, fig. 32E; tactile seta of the fourth pedal tarsus located distad from the mid-point of the segment. A single species is known from the north-central states.

### *Parachernes squarrosus* new species

*Chelanops pallidus* Ewing (1911, p. 78), (*non Chernes pallidus* Banks). Misidentification.

The present species figs. 32A-32E, bears considerable relationship to two species described by Nathan Banks, *Parachernes pulchellus* from Texas and *virginicus* from Virginia. From *pulchellus*, *squarrosus* may be distinguished by the absence of silver blotches on the outer ends of the abdominal tergites and by the flatly convex rather than evenly convex outer margin of the palpal femur. From *virginicus*, this new species can be distinguished by the more granular nature of the palpal segments, the fewer plates in

the serrula exterior, and the slightly different size and length-width ratio of the palpal femur.

Among the local fauna, *squarrosus* can be identified readily on the basis of the lightly colored silver blotches along the posterior margin of the carapace. No other Illinois pseudoscorpion has such a pigment pattern.

Two specimens from Ewing's collections were found to belong to this species. One specimen, a female, deposited in the Museum of Comparative Zoology, had been labeled *Chelanops virginica* but this name had been deleted and the identification *C. pallidus* supplied. This specimen was apparently reported by Ewing (1911) under the name *pallidus* from "under bark" at Arcola, Illinois. The date of collection of this specimen was June 12, 1908. The second specimen available from the Ewing collections is a male deposited at the Cornell University Museum. The slide of this specimen bears the deleted name *Chelanops pallidus*, which was replaced by the identification *Chelanops sanborni*. The specimen was taken under the bark of a living oak tree at Marshall, Illinois, on October 10, 1908. Since Ewing (1911) reported *pallidus* but not *sanborni* from Marshall, this specimen was probably reported as *pallidus*.

The erroneous identification of the present species as *pallidus* (Banks) is easily explained since, during the time Ewing worked, generic and specific characters were poorly understood and inadequately described. We now know that the species *pallidus* belongs to the genus *Dinocheirus* as indicated elsewhere in this paper. Cleared specimens of *Dinocheirus pallidus* and *Parachernes squarrosus* are superficially similar and can easily be confused. However, the cheliceral flagellum of *pallidus* has four setae while there are only three setae in the cheliceral flagellum of *squarrosus*.

MALE.—Measurements and ratios are given as the limits of variation of three individuals, including the holotype. Body and palps fairly stout, legs moderately slender; body and appendages for the most part distinctly granular; color varying from yellow on the legs to reddish or golden brown to brown on the palps and carapace, and dark brown on the tergites; body 1.8-1.9 mm. long. Carapace, fig. 32A, with surface coarsely granular except for a transversely placed white blotch along the posterior margin on each side of the median line; posterior mar-

gin with 8 to 12 subclavate to clavate marginal setae placed just anterior to the white blotches; anterior margin weakly convex, with four stout setae, each with a few subterminal and terminal denticulations; carapace narrowed rapidly anterior to the mid-point, posterior portions of lateral margins of two sides nearly parallel; the median transverse furrow near the mid-point of the face of the carapace, the posterior furrow anterior to the white blotch of each side and a little closer to the posterior carapacic margin than to the median furrow; setae of face and sides of carapace short, slender, subclavate or paucidenticulate; a single pair of eye spots; carapace 0.65–0.7 mm. long, width just posterior to the center of the carapace 0.5–0.6 mm.; ocular width about 0.3 mm. Abdomen suboval in general shape; 1.1–1.3 mm. long; 0.8–0.9 mm. wide. Tergites except the eleventh divided; dark brown in color; granulations very similar to those

of the carapace; the medial end of some of the tergites lighter in color than the rest of the tergite; the lateral ends of tergites not bearing lightly colored blotches; each tergite with a single row of marginal setae and, in addition, frequently with a lateral seta at each outer end of the tergite; setae of all but the eleventh tergite weakly clavate; four to seven setae on each half-tergite; eleventh tergite with four to five pairs of subacuminate to acuminate setae. Sternites 4 through 10 divided; sternites dark brown, surface marked by scalelike or net-like impressions; setae acuminate, moderately long, very slender; fourth sternite with eight setae; each of sternites 5 through 10 with 12 to 18 setae; sternite 11 with three pairs of setae, the medial and lateral pairs of which are very long. Pleural membranes with wavy parallel striations; anterior stigmatic plate with one or two acuminate setae, posterior plate with one.

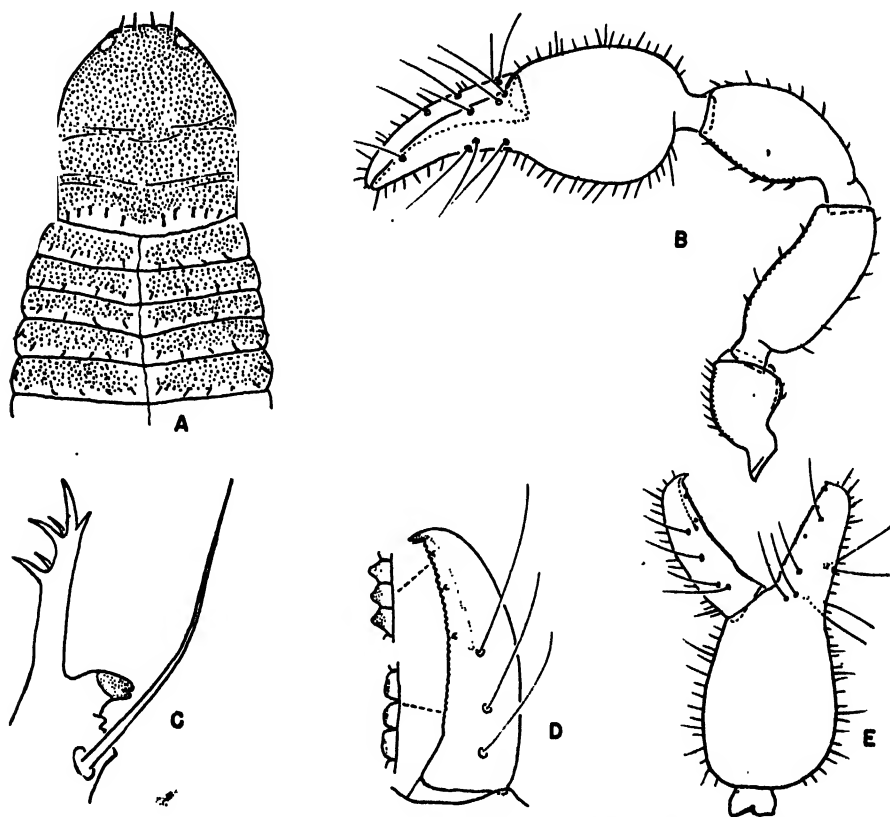


Fig. 32.—*Parachernes squarrosus*. A, dorsal view of carapace and five anterior tergites, holotype ♂; B, dorsal view of palp, holotype ♂; C, galea and tip of movable cheliceral finger, paratype ♂; D, lateral view of movable chelal finger with teeth enlarged, paratype tritonymph; E, lateral view of chela, allotype ♀.



*Chelicera*.—Light brown in color, sometimes with a greenish tinge; 0.185–0.19 mm. long, base about 0.12 mm. wide; movable finger 0.16–0.17 mm. long. Flagellum of three setae, the longest having six to eight fine denticulations along the distal half of the anterior margin. Fixed finger with conspicuous lamina exterior; most teeth of the serrula interior fused, but the distal four teeth free and with serrate margins; inner margin of finger with three retroconical teeth near the distal end; apical tooth acute and with three small, rounded denticles on the inner surface. Movable finger, fig. 32C, fairly stout, slightly curved; apical tooth well developed, terminally split to form two cusps; subapical tooth weakly developed, located just distad from the insertion of the galeal seta; two small, conical denticles or accessory teeth sometimes found on the inner margin of the movable finger between the subapical tooth and the base of the apical tooth; galeal seta extending slightly beyond the tip of the galea; serrula exterior of 19 to 21 ligulate plates; galea fairly stout and straight, with six or seven simple rami confined to the terminal one-half or one-third of the galea; considerable variation in the stoutness of the galea.

*Palp*.—Fig. 32B. Lateral surface of maxilla, all surfaces of trochanter, and the flexor surfaces of the femur and tibia coarsely granulate; rest of palp weakly granular to smooth; setae varying from acuminate to subclavate and paucidentate. Maxilla with acuminate and slender setae; 0.295–0.305 mm. long, 0.22–0.23 mm. wide, length 1.35 to 1.4 times the width. Trochanter with inner margin regularly convex, surface bearing numerous short setae with terminal and subterminal denticulations; a well-rounded, dorsolateral protuberance present; trochanter 0.24–0.26 mm. long, 0.17–0.175 mm. wide. Femur with pedicle wider than long, well separated from the rest of the segment; extensor margin flatly convex, except at the ends; flexor margin distinctly S-shaped, concave in the distal half of the segment but distinctly convex in the proximal portion; granulations coarser and much more marked on the medial than on the sometimes nearly smooth, outer surface; setae of the medial surface sparse and subclavate, setae of the lateral surface somewhat longer and with few denticulations; femur 0.48–0.505 mm. long, 0.19–0.22 mm. wide, length 2.3 to 2.5 times the width.

Tibia pedicellate, with pedicle about as long as wide; outer margin of tibia including the pedicle evenly convex; inner margin centrally bulged and convex but slightly flattened in the distal one-third; setae much as in the femur; flexor or medial surface coarsely granulate; outer or lateral surface virtually smooth; 0.45–0.48 mm. long, 0.215–0.235 mm. wide, length 2.0 to 2.15 times the width. Chela stout; setae of hand relatively long, with one or two very fine submedial to subterminal denticulations on each; setae of fingers acuminate; hand with a few fine granulations on the inner aspect near the base of the fingers, otherwise smooth; flexor margin of chelal hand slightly more convex than the extensor; pedicle placed nearer the outer than the inner surface of the hand; fingers evenly curved; chela, without pedicle, 0.785–0.835 mm. long, 0.32–0.33 mm. wide, length 2.4 to 2.5 times the width; chelal hand 0.32–0.36 mm. deep, hand, without pedicle, 0.41–0.43 mm. long; movable finger about equal in length to length of hand without pedicle. As viewed from the side, dorsal margin of the chelal hand more convex than the ventral; the pedicle displaced toward the ventral side; fixed finger stout and nearly straight; movable finger distinctly curved. Marginal teeth of both fingers contiguous; distal teeth acute and each with a well-marked cusp, proximal teeth more rounded and with weak cusps; 30 to 35 marginal teeth on each finger; each finger with five to seven external and two or three internal accessory teeth. Tactile setae as in fig. 32B; nodus ramosus of movable finger located slightly proximad from the areole of tactile seta *t*.

*Legs*.—Surfaces, except the posterior, of the basal segments of legs fairly well marked by scalelike sculpturing, becoming weaker on the distal segments; setae variable. First leg with stout trochanter, 0.11–0.115 mm. long; pars basalis 0.115–0.12 mm. deep; pars tibialis almost smooth to coarsely granulate, 0.107–0.122 mm. deep; entire femur 0.3–0.35 mm. long; tibia with extensor margin weakly S-shaped, greatest depth in the distal one-fourth, 0.23–0.25 mm. long, 0.072–0.087 mm. deep, length 2.85 to 3.2 times the depth; tarsus subcylindrical, with weak sculpturing, setae not abundant, 0.23–0.24 mm. long, 0.053–0.057 mm. deep, length 4.2 to 4.4 times the depth. Fourth leg with pars basalis almost smooth, a few long acuminate setae on the flexor surface, subtriangular in

outline, 0.137–0.14 mm. deep; pars tibialis with anterior surface conspicuously sculptured, posterior surface almost smooth, flexor margin almost straight, 0.165–0.175 mm. deep; entire femur 0.44–0.465 mm. long, length 2.65 to 2.75 times the depth; tibia with extensor margin slightly S-shaped to almost straight, 0.35–0.37 mm. long, 0.095–0.102 mm. deep, length 3.65 to 3.85 times the depth; tarsus subcylindrical, numerous acute setae on the flexor surface, a few relatively long and subterminally denticulate setae on the extensor surface, weakly developed sculpturing, 0.28–0.30 mm. long, 0.065–0.0685 mm. deep, length 4.3 to 4.5 times the depth; a long and slender tactile seta inserted 0.165–0.19 mm. from the proximal margin of the tarsus.

*Genital Complex.*—Anterior operculum with usually 8 to 12 marginal setae near the anterior margin of the genital aperture and with as many as 30 setae more anteriorly located on the operculum; posterior operculum with 6 to 10 setae on the posterior lip of the genital aperture and 8 to 10 widely separated and very slender setae in a transverse row between the genital slit and the posterior margin of the operculum.

*FEMALE.*—Measurements and ratios based on four individuals, including the allotype. In general, much like the male; body length 1.85–2.20 mm.; carapace 0.675–0.75 mm. long, width 0.85 to 0.95 times the length; ocular width 0.32–0.34 mm.; abdomen 1.15–1.50 mm. long, 0.9–1.05 mm. wide.

*Chelicera.*—Similar to the male; 18 to 19 plates in the serrula exterior; length of chelicera 0.2–0.215 mm., width of base 0.13–0.14 mm., length of movable finger 0.175–0.19 mm.

*Palp.*—Segments slightly larger than in the male but the length-width ratios almost identical in the two sexes; maxilla 0.33–0.35 mm. long, 0.25–0.28 mm. wide, length 1.2 to 1.45 times the width; trochanter 0.26–0.27 mm. long, 0.18–0.195 mm. wide, length 1.35 to 1.45 times the width; femur 0.52–0.535 mm. long, 0.215–0.225 mm. wide, length 2.35 to 2.5 times the width; tibia 0.48–0.495 mm. long, 0.235–0.25 mm. wide, length 1.95 to 2.05 times the width; chela, without pedicle, 0.865–0.885 mm. long, 0.34–0.375 mm. wide, length 2.37 to 2.55 times the width; chelal hand exclusive of pedicle 0.47–0.485 mm. long, 0.34–0.38 mm. deep; movable finger 0.445–0.465 mm. long. Teeth, both marginal and accessory, much

as in the male except slightly more variation in number. Tactile setae arranged as in the male.

*Legs.*—Essentially as in the opposite sex; some segments, however, slightly larger in actual size and sometimes a little more extensively granulate. First leg with trochanter 0.115–0.125 mm. long; pars basalis 0.123–0.133 mm. deep; pars tibialis 0.12–0.13 mm. deep; entire femur 0.33–0.375 mm. long; tibia 0.24–0.26 mm. long, 0.08–0.085 mm. deep, length 2.8 to 3.05 times the depth; tarsus 0.235–0.255 mm. long, 0.06–0.065 mm. deep, length 3.8 to 4.2 times the depth. Fourth leg with trochanter 0.19–0.195 mm. long, length 1.3 to 1.65 times the depth; pars basalis 0.145–0.16 mm. deep; pars tibialis 0.17–0.19 mm. deep; entire femur 0.48–0.515 mm. long, length 2.6 to 3.0 times the depth; tibia 0.36–0.39 mm. long, 0.1–0.112 mm. deep, length 3.35 to 3.85 times the depth; tarsus 0.285–0.31 mm. long, 0.069–0.075 mm. deep, length 4.0 to 4.45 times the depth; sensory seta 0.175–0.195 mm. from proximal margin of tarsus.

*Genital Complex.*—Anterior operculum with between 20 and 25 (in one individual only 17) setae arranged chiefly in a medially placed triangular group; posterior operculum with six or eight widely scattered setae arranged in a single marginal row.

*TRITONYMPH.*—Description based on two individuals. Measurements of one are given in parentheses after the corresponding measurements of the other whenever the two differ significantly. Same general features as in the adult except that the body is less darkly colored and less sclerotic; length 1.65 mm. Carapace light yellowish-brown; white blotches near the posterior margin fused medially to form a single transverse bar anteriorly to and isolating a small median pigmented area lying near the posterior margin of the carapace; carapace 0.55 (0.575) mm. long, with the greatest width but little less than the length. Abdomen much as in the adult; tergites, however, lighter in color and less sclerotic; setae of tergites less clavate and in some cases almost acuminate; sternites as in the adult except less darkly colored, not so coarsely granular, and with fewer setae.

*Chelicera.*—In general with the characteristics in the adult; serrula exterior with 16 or 17 ligulate plates; chelicera 0.16 (0.17) mm. long, base 0.1 (0.11) mm. wide, movable finger 0.15 mm. long.

**Palp.**—In general shape, chaetotaxy, and sculpturing much as in the adult; the pedicles of the femur and tibia are much wider than long and poorly separated from the rest of the segment; tibia a little stouter and the chela a little more slender than in the adult. Maxilla 0.285 mm. long, trochanter 0.205 (0.215) mm. long, femur 0.38 mm. long; tibia 0.355 (0.34) mm. long, 0.195 mm. wide; chela 0.695 (0.675) mm. long, 0.262 (0.258) mm. wide; chela depth about 0.26 mm., hand length 0.37 mm.; movable chelal finger 0.36 (0.35) mm. long. Marginal teeth, fig. 32D, of each finger between 25 and 30 in number; the distal 8 to 12 teeth of the marginal row of each finger acute and with well-formed cusps, other teeth blunt, rounded, with very weak cusps or without cusps; accessory teeth fewer in number and more weakly developed than in the adult. The three tactile setae of movable finger as shown in fig. 32D. Fixed finger with four tactile setae in external series, arranged much as in the adult male; internal series of three tactile setae with *it* slightly more than twice as far from the finger tip as from the level of *et* and somewhat distad from the level of *est*; *isb* and *ib* as in the adult; *ist* wanting.

**Legs.**—In general as in the male, except segments a little stouter, lighter in color, less sclerotic, and with fewer setae. First leg with entire femur about 0.25 mm. long; tibia with extensor margin straight except at the proximal end, 0.18 (0.175) mm. long, length 2.6 (2.4) times the depth; tarsus with both margins more convex than in the adult, 0.185 (0.19) mm. long, length about 3.2 times the depth. Fourth leg with pars basalis about 0.13 mm. deep; pars tibialis 0.15 (0.155) mm. deep; entire femur 0.375 mm. long, length 2.5 (2.4) times the depth; tibia with extensor margin almost straight, 0.29 (0.277) mm. long, 0.087 (0.08) mm. deep; tarsus with both margins conspicuously convex, 0.22 (0.225) mm. long, about 0.075 mm. deep; sensory seta of tarsus shorter than in the adult and inserted 0.115 (0.13) mm. from the proximal margin of the segment.

**Holotype, male.**—Fowler, Illinois: bark of oak tree, July 19, 1944, C. C. Hoff.

**Allotype, female.**—Karnak, Illinois: Feb. 24, 1933, Ross & Mohr.

**Paratypes.**—ILLINOIS.—ARCOLA: under bark, June 12, 1908, H. E. Ewing, 1 ♀ (MCZ). CARBONDALE: jarred from willow

and sycamore branches, Sept. 22, 1908, L. N. Smith, 11 nymphs and adults. CENTRALIA: under pear bark, June 18, 1947, L. J. Stannard, 1 ♂. FOWLER: same data as for holotype, 1 ♂ (JC). KARNAK: same data as for allotype, 1 ♀. LAKE GLENDALE: ground cover, March 17, 1943, Ross & Sanderson, 1 nymph. MARSHALL: under bark of living oak tree, Oct. 10, 1908, H. E. Ewing, 1 ♂ (CU). QUINCY: near Benton's Cave, inner layer of bark on log, April 27, 1944, C. C. Hoff, 1 ♂ (CH); nest in bluebird box, Oct. 30, 1945, T. E. Musselman, 1 nymph (CH). URBANA: under bark of maple, June 18, 1942, K. M. Sommerman, 1 ♂; under bark, July 20, 1944, K. M. Sommerman, 1 ♀.

This species is usually found under the bark of deciduous trees or logs but may occasionally be taken in woody debris and forest ground cover. The tritonymph collected at Quincy by T. E. Musselman was taken from a nest in a bluebird box.

### 13. *CHELANOPS* Gervais

*Chelanops* Gervais, in Gay (1849, p. 13).

Genotype, monobasic: *Chelifer* (*Chelanops*) *coecus* Gervais.

*Chelanops* Gervais. Beier (1932c, p. 177), Hoff (1947, p. 503).

Carapace somewhat longer than wide, granular; tergites divided, granular. Setae of body and palps somewhat variable, plumose, and usually appearing subclavate to clavate. Flagellum with four setae. Palp, fig. 33, moderately heavy, granular; tactile seta *ist* placed on the same level with *est* or a little proximad from *est*; *st* nearer to *t* than to *sb*. Tarsus of fourth leg without a tactile seta.

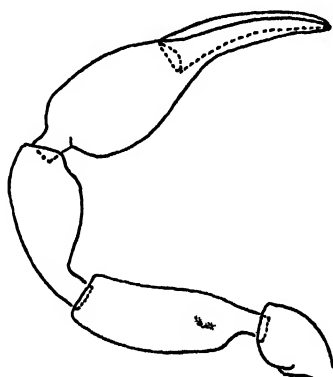


Fig. 33.—*Chelanops affinis* ♂. Dorsal view of palp (setae omitted).

The genus is confined to the Americas, chiefly South and Central America and the West Indies, and, as now limited, contains a small number of species. One species, *Chelanops affinis* Banks, is recorded from Florida. Many species were assigned to *Chelanops* by earlier authors, but most of them have been transferred to other genera.

#### 14. *PSELAPHOCHERNES* Beier

*Pselaphochernes* Beier (1932c, p. 130), (1933, p. 520). Genotype, by original designation: *Chelifer scorpoides* Hermann.

Cephalothorax somewhat longer than wide, fig. 34D, fairly well granulated; setae of body and palps moderately long, toothed, and often lightly clavate; three blades in the cheliceral flagellum; a single internal accessory tooth on each chelal finger; fixed finger with short and vestigial venedens and duct; tactile seta *ist* of the fixed finger on about the same level as *est*. Internal series of tactile setae not forming a basal group, fig. 34B; seta *st* a little nearer to *t* than to *sb* or about midway between the two; tarsus of fourth leg with a tactile seta near the mid-point or slightly proximad from the mid-point of the segment.

Except for a doubtful record of the European *scorpoides* from the eastern United States, only the following species is known from the nearctic region.

#### *Pselaphochernes parvus* Hoff

*Pselaphochernes parvus* Hoff (1945a, p. 38).

Diagnostic characters of the species are illustrated in fig. 34. A full description of the female is given in the original description. Study of the present material has brought to light the undescribed male of the species and has led to a clearer demonstration of the differences between *parvus* and the closely related European species, *scorpoides* (Hermann). Several characteristics that can be expressed numerically serve to separate the two forms. The chela of the female of *parvus* has a length 2.9 to 3.15 times the width, while in *scorpoides* the chela is 2.7 times as long as wide; in the male of *parvus* the femur is 0.45–0.51 mm. long, in *scorpoides* 0.43 mm.; the chela of the male of *parvus* is 3.1 to 3.2, but in *scorpoides* 2.9, times as long as wide; in *parvus* the movable chelal finger of the male is 0.41–0.45 mm. long, in *scorpoides* 0.38 mm. Measurements for *scorpoides* have been taken from Beier (1932c). There is

also a distinct difference between the two species in the amount of flattening of the outer margin of the chelal hand, our Illinois species, fig. 28, having a much more flattened margin than does *scorpoides* as figured by Beier (1932c). An atypical male in one of the collections appears to resemble the male of *scorpoides* as figured by Beier (1932c), but the length of the palpal segments and the somewhat flattened external margin of the chelal hand indicate that the individual is not *scorpoides*.

**MALE.**—Measurements and ratios are based on four individuals. Body moderately stout; yellow in color except for light brown or golden colored palps; 1.5–1.9 mm. long; carapace, fig. 34D, with straight to slightly convex posterior margin and with 8 to 10 marginal setae; anterior margin bluntly rounded and with four setae; anterior half of each lateral margin convex, posterior half of lateral margins straight and parallel; median and posterior transverse furrows not well marked; surface moderately granular, light brown in color; numerous setae scattered over the face and sides; setae subclavate, with a few terminal denticulations; no eye spots; length of carapace 0.53–0.61 mm., greatest width 0.45–0.51 mm. near center, posterior width almost equal to the greatest width. Abdomen 0.95–1.3 mm. long, 0.6–0.72 mm. wide; length 1.5 to 1.8 times the width. Tergites weakly sclerotic, inconspicuously divided except the eleventh; half-tergites each usually with five to seven (occasionally eight) widened and terminally paucidenticulate setae. Sternites 4 through 10 divided, most half-sternites with from 9 to 11 (occasionally more) acuminate setae, chiefly confined to a marginal row; fourth sternite with three to five setae forming a marginal row in each half-sternite. Pleural membranes marked by wavy, subpapillose, longitudinal plications. Each anterior stigmatic plate with one seta; each posterior plate with two.

**Chelicera.**—Length 0.175–0.195 mm., width 0.11–0.125 mm., the laminal and interior setae acuminate, simple, much longer than the basal and subbasal; basal, subbasal, and exterior setae denticulate along the distal fourth. Flagellum of three blades, the distal one bearing 10 to 12 denticulations on the anterior edge along the distal two-thirds. Fixed finger with well-developed lamina exterior; the serrula interior with five free and serrate marginal teeth, remain-

der fused into a velum; apical tooth with two or three internal denticles; the internal margin of finger with six or seven denticles arranged along the distal one-third of the finger. Movable finger, fig. 34A, 0.173–0.185 mm. long; serrula exterior of 18 ligulate plates, the basal one or two but little longer than the remainder; subapical lobe close to end of finger and subequal in size to the apical or terminal tooth; galeal seta extending just beyond the tip of the galea; galea less well developed than in the female, usually with two main rami, each of which is in turn branched or bifurcated.

**Palp.**—Fig. 34C. Moderately granular except that the fingers are smooth and the flexor surfaces of the femur and tibia are coarsely granular; setae subclavate to acuminate. Maxilla with scattered acuminate setae; 0.275–0.31 mm. long; length about 1.5 times the width. Trochanter with two protuberances, coarsely granular; numerous multidenticulate setae on inner surface; length 0.255–0.275 mm., 1.45 to 1.55 times the width. Femur with pedicle about as long as wide; extensor margin convex and with numerous setae varying from short and multidenticulate near the base to longer and paucidenticulate near the distal end; flexor surface coarsely granular and with a few setae like those of the trochanter; flexor

margin weakly S-shaped; length measured along the extensor margin 0.45–0.51 mm., maximum over-all length a little greater; 0.17–0.195 mm. wide; length 2.55 to 2.65 times the width. Tibia slightly shorter and wider than the femur; granulations and chaetotaxy much as in the femur; extensor margin somewhat flatly convex but more convex toward the distal end; flexor margin bulging in the center; 0.435–0.485 mm. long, 0.185–0.215 mm. wide; length 2.23 to 2.35 times the width. Chela moderately slender; hand granulate and with long subacuminate setae, each with one or two subterminal denticulations; outer margin of chela flatly convex, inner margin more convex; fingers curved; chela 0.75–0.83 mm. long, 0.24–0.27 mm. wide, length 3.1 to 3.2 times the width; 0.235–0.27 mm. deep; hand length without pedicle 0.385–0.43 mm.; finger slightly longer than hand without pedicle, measuring from 0.41–0.45 mm. Viewed laterally, fig. 34B, both dorsal and ventral margins of hand appear convex. Each finger with between 35 and 45 marginal teeth, contiguous, and with well-developed cusps; a single interior accessory tooth on each finger, located slightly more than one-fourth of finger length from the tip; usually seven or eight exterior accessory teeth on each finger, spaced along the distal three-fourths of the

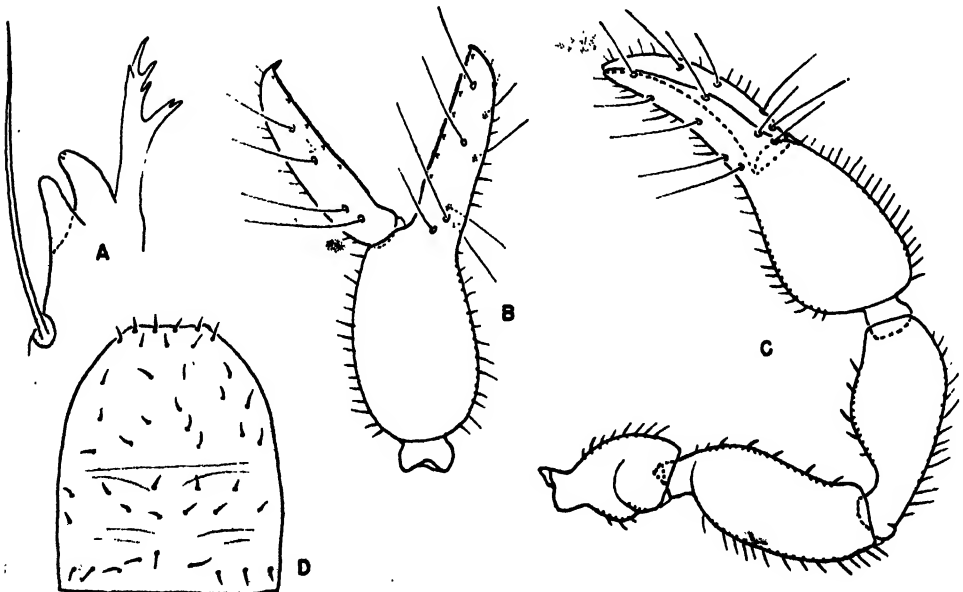


Fig. 34.—*Psalaphochernes parvus* ♂. A, tip of movable cheliceral finger; B, lateral view of chelal hand; C, dorsal view of palp; D, dorsal view of carapace.

finger length. Tactile setae of chelal fingers as shown in the figure.

**Legs.**—Yellow to very pale brown in color; moderately slender; subterminal setae and tarsal claws simple and entire; surface usually weakly marked by scalelike lines; setae varying from paucidenticulate to acuminate. First leg with trochanter about 0.12 mm. long, several relatively long paucidenticulate setae on flexor surface as well as a long acuminate pseudotactile seta; pars basalis 0.125–0.135 mm. long, length 1.2 to 1.4 times the depth; pars tibialis with a weakly convex extensor margin, flexor margin more weakly convex and almost straight, setae of extensor margin short and paucidenticulate, those of flexor surface slightly longer and almost acuminate, length of pars tibialis 0.183–0.23 mm., depth 0.08–0.114 mm., length 2.0 to 2.3 times the depth; tibia with a very weakly S-shaped extensor margin, flexor margin weakly convex, chaetotaxy as in the pars tibialis, tibia 0.23–0.26 mm. long, 0.065–0.077 mm. deep, length 3.35 to 3.55 times the depth; tarsus with flexor margin slightly convex, extensor margin nearly straight, setae more numerous than on other segments, setae varying from terminally and subterminally denticulate on the basal part of the extensor surface to truly acuminate on the terminal portion of the segment; tarsus 0.24–0.27 mm. long, 0.05–0.054 mm. deep, length 4.6 to 5.1 times the depth. Fourth leg with chaetotaxy and sculpturing as in the first leg; trochanter with numerous setae, especially on the flexor surface, length 0.16–0.17 mm., 1.35 to 1.45 times the depth; pars basalis subtriangular, distal three-fourths of flexor margin straight, flexor surface with numerous long and subacuminate setae, length 0.16–0.175 mm., 1.3 to 1.45 times the depth; pars tibialis with extensor margin evenly and moderately convex, flexor margin straight and continuous with that of the pars basalis; pars tibialis 0.3–0.35 mm. long, 0.122–0.15 mm. deep, length 2.3 to 2.45 times the depth; entire femur 0.42–0.48 mm. long, length 3.2 to 3.45 times the depth; tibia with weakly S-shaped extensor margin and convex flexor margin, length 3.5 to 3.85 times the depth; tarsus with both flexor and extensor margins weakly convex, slightly narrowed distally, deepest near the level of the sensory seta, chaetotaxy much as in the tarsus of the first leg, 0.26–0.315 mm. long, 0.065–0.07 mm. deep, length 4.4 (4.0 in one individual) to 4.75 times the

depth; sensory seta of the extensor surface of the tarsus located proximad from the mid-point of the segment, usually little more than 0.4 of the tarsus length from the proximal margin.

**Genital Complex.**—Anterior operculum with about 20 setae arranged in a crescent; posterior operculum with 8 to 10 (rarely 12) marginal setae; four (rarely five or six) setae on the posterior lip of the genital opening, almost within the opening, and anterior to the marginal row.

**FEMALE.**—Females much more numerous than males. Female differing but little from male; slightly larger, up to 2.2 mm. or more in length, often a little more darkly pigmented than the male. Carapace and abdomen not distinctly different in the two sexes.

**Chelicera.**—Slightly larger and with the galea more branched than in the male; otherwise almost identical in the two sexes.

**Palps.**—Most segments, especially the chela, slightly larger than in the male; otherwise similar. Chela (measurements based on 16 Illinois specimens) exclusive of pedicle 0.85–0.95 mm. long, 0.27–0.31 mm. wide, length 2.9 to 3.15 (rarely less than 3.0) times the width; movable finger 0.45–0.51 mm. long. Teeth and tactile setae of chela as in the male; length-width ratios of chelae of Illinois specimens on the average slightly less than the ratios for the type specimens from Arkansas (Hoff 1945a).

**Legs.**—Shape, chaetotaxy, and sculpturing essentially as in the male; segments, however, frequently larger; length-depth ratios about the same in the two sexes. The following measurements and ratios of certain pedal segments in the female are based on measurements of nine individuals: tibia of first leg 0.255–0.295 mm. long, 0.072–0.08 mm. deep, length 3.4 to 3.85 times the depth; tarsus of first leg 0.27–0.3 mm. long, 0.053–0.059 mm. deep, length 4.6 to 5.2 times the depth; pars tibialis of fourth leg 0.35–0.4 mm. long, 0.135–0.155 mm. deep, length 2.45 to 2.75 times the depth; tibia of fourth leg 0.345–0.385 mm. long, 0.09–0.1 mm. deep, 3.7 to 4.2 times as long as deep.

**Genital Complex.**—Anterior operculum with 14 to 18 setae; posterior operculum with 8 or 10 setae.

**TRITONYMPH.**—Measurements are based on three individuals mounted in balsam. Much like the adult but smaller and lighter in color; appendages stouter. Body 1.35–1.55 mm. long; carapace about 0.5 mm. long

and about 0.4 mm. wide; abdomen between 0.6 and 0.7 mm. wide. Chelicera essentially as in the adult. Palpal segments conspicuously and coarsely granular on the flexor surfaces, other surfaces moderately granular; chelal hand moderately granular; trochanter 0.22–0.23 mm. long, 0.13–0.14 mm. wide; femur with maximum length between 0.33 and 0.35 mm., length along the extensor margin 0.3–0.32 mm., width 0.14–0.15 mm., greatest length 2.3 to 2.5 times the width, length along the extensor margin 0.21 to 0.23 times the width; tibia about 0.33 mm. long, 0.16 mm. wide; chela 0.61 mm. long, 0.205–0.21 mm. wide, length between 2.9 and 3.0 times the width; depth of chelal hand subequal to the width; chelal hand 0.32 mm. long; movable chelal finger 0.29–0.31 mm. long. Tactile setae of the chelal fingers much as in the adult except *b* is missing from the movable finger and *ist* is wanting from the fixed finger; also *it* is much closer to the level of *est* than to the level of *et*, while in the adult *it* is closer to the level of *et* than to the level of *est*. Marginal and accessory chelal teeth much as in the adult except fewer in number.

**DEUTONYMPH.**—Two specimens examined. Smaller than the tritonymph but same general characteristics. Body length 1.0–1.05 mm., carapace about 0.38 mm. long. Serrula exterior of the movable cheliceral finger with 14 or 15 ligulate plates. Palpal segments smaller than in the tritonymph but with about the same length-width ratios. Palp with the following measurements (based on two individuals): trochanter about 0.17 mm. long, 0.1 mm. wide; femur with greatest length between 0.24 and 0.25 mm., width 0.11 mm.; tibia 0.23 to 0.24 mm. long, 0.12 mm. wide; chela exclusive of pedicle 0.45 to 0.46 mm. long, 0.148–0.155 mm. wide, length 2.9 to 3.1 times the width; chelal hand with length of 0.24 mm., depth about equal to the width; movable chelal finger 0.22 mm. long. Movable chelal finger with two tactile setae: one, probably *st*, near the mid-point of the finger and the second, probably *sb*, near the proximal margin; nodus ramosus a little distad from *st*. Fixed chelal finger with tactile setae much as in the tritonymph but with both *ist* and one of the external series, probably *esb*, wanting. Accessory teeth of chelal fingers apparently wanting.

**PROTONYMPH.**—Somewhat smaller and with conspicuously stouter appendages than

the deutonymph; body length about 0.9 mm. Serrula exterior of the movable cheliceral finger apparently of 11 plates. Chela exclusive of pedicle about 0.4 mm. long, about 0.14 mm. wide; chelal hand exclusive of pedicle 0.21 mm. long; movable finger equal in length to length of hand exclusive of pedicle. Movable finger with one tactile seta, probably *st*, located about two-fifths of the finger length from the proximal finger margin. Fixed finger with one tactile seta, probably *est*, located somewhat distad from the mid-point of the finger and one basal seta of the external series located near the finger base; internal series represented by a single tactile seta located about on a level with the single basal seta of the external series.

**DISTRIBUTION.**—Known only from Arkansas and Illinois; taken from scattered localities in all areas of the latter state. Habitat data are available for 25 collections. Sixteen of these collections were made from rotting logs or hollow trees and, in two of these, nests of small mammals were present. The other collections were made from woody debris and ground cover. The collections indicate a decided association with rotting wood as a preferred habitat.

**Illinois Records.**—Thirty collections, taken throughout the year, are from Cache, Caledonia, Elk Grove, Elsah, Grand Tower, Harrisburg, Herod, Kampsville, Karnak, La Rue, Makanda, Monticello, Mount Olive, Pere Marquette State Park, Quincy, Sherman, Urbana.

### 15. *DENDROCHERNES* Beier

*Dendrochernes* Beier (1932c, p. 171). Genotype, monobasic: *Chernes cyrneus* L. Koch. *Dendrochernes* Beier. Hoff (1947, p. 536).

Carapace almost quadrate or a little longer than wide, weakly to moderately granular, the posterior transverse furrow nearer to the posterior carapacic margin than to the median transverse furrow. Tergites except the eleventh divided, finely to moderately granular. Setae of the body and palps toothed, not appearing clavate. Flagellum of four setae. Palp heavy, fig. 35, finely to moderately granular; tactile seta *ist* is almost at the same level as *est*, *st* is nearer to *sb* than to *t*. Tarsus of fourth leg with a sensory seta distad from the mid-point of the segment.

The genus is holarctic in distribution. In North America, *Dendrochernes morosus*

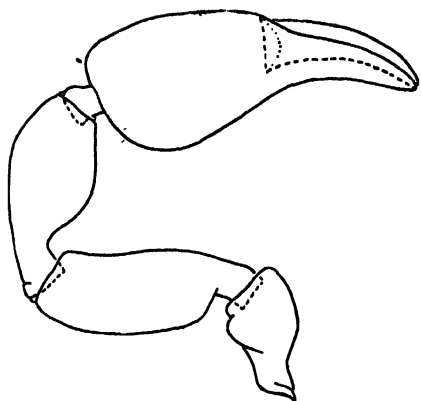


Fig. 35.—*Dendrochernes morosus* ♀. Dorsal view of palp (setae omitted).

(Banks) is recorded from Isle Royale, Lake Superior.

#### 16. *REGINACHERNES* new genus

**DIAGNOSIS.**—Chelicera with flagellum of four setae; seta *b* of cheliceral hand acuminate, *sb* stout and subterminally denticulate, fig. 36D; subapical lobe of movable cheliceral finger well developed, figs. 36E, 37C, finger-like, and conspicuous; galea stout, with several simple terminal and subterminal rami. Palp stout; tactile seta *st* of movable chelal finger midway between *t*

and *sb* or somewhat closer to *t* than to *sb*, *ist* of fixed chelal finger distad from *est*, figs. 36A, 37B; setae of palp subclavate to clavate; little sexual dimorphism exhibited by palp; fixed chelal finger with reduced venedens and short vestigial venom duct, fig. 36B. Fourth leg with no true tactile seta on the tarsus, but with a denticulate pseudotactile seta near the distal end. Seminal receptacle of the female in the form of a long and slender tubule with a terminal sac or bulb.

**Genotype.**—*Reginachernes ewingi* new species.

Because it lacks a tactile seta on the tarsus of the fourth leg, the present genus appears closely related to the genus *Hesperochernes* Chamberlin, but differs in having the tactile seta *b* of the cheliceral hand acuminate and not denticulate as in *Hesperochernes*. The genus *Reginachernes* also bears some resemblance to *Allochernes* Beier, but the two genera differ in number of setae in the cheliceral flagellum.

#### KEY TO SPECIES

- |  |       |                  |
|--|-------|------------------|
| Length of chela exclusive of pedicle less than 0.9 mm., length of femur less than 0.55 mm. | ..... | <i>ewingi</i>    |
| Length of chela exclusive of pedicle more than 0.9 mm., length of femur more than 0.55 mm. | ..... | <i>lymphatus</i> |

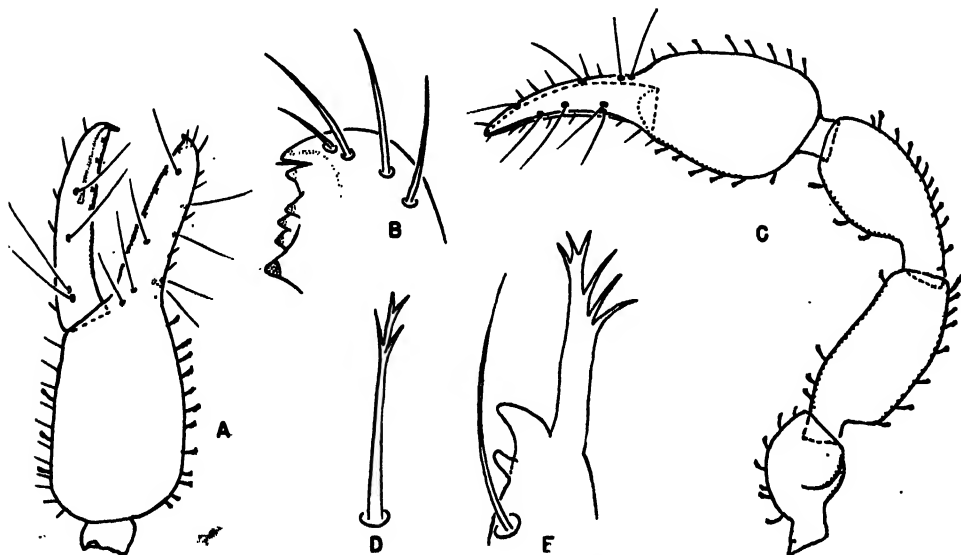


Fig. 36.—*Reginachernes ewingi*, holotype ♀. A, lateral view of chela; B, end of fixed chelal finger to show vestigial venedens; C, dorsal view of palp; D, tactile seta *sb* of the cheliceral hand; E, tip of movable cheliceral finger.



*Reginachernes ewingi* new species

Only two individuals, one male collected by Ewing more than 30 years ago, and one female, are available for study. Since the male is not in good condition for detailed examination, the female has been designated as the holotype fig. 36. The specimen collected by Ewing and deposited at the Museum of Comparative Zoology has, according to data accompanying the slide, been assigned successively to the species *Chelanops morosus* Banks and *Chelanops sanborni* (Hagen). The specimen appears to be more closely related to *Hesperochernes sanborni* as re-described by Hoff (1946a) than to *Dendrochernes morosus* as also re-described by Hoff (1947), but belongs to neither of these species. The present specimen appears not to have been reported by Ewing (1911) under either *Chelanops morosus* or *sanborni*, since the only specimens collected at Arcola and assigned by Ewing to the genus *Chelanops* were listed as *Chelanops pallidus*. It is possible that this specimen was not included in the report made by Ewing in 1911.

**FEMALE.**—Body and appendages fairly stout; abdomen, carapace, and legs brown; palps deeper golden brown; length of body about 2 mm. Carapace rounded anteriorly and laterally; surface coarsely granulate; anterior margin with 4 and the posterior margin with 8 to 10 setae; all carapacic setae distinctly clavate; greatest width near the center of the carapace, slightly narrower behind; length of carapace 0.65 mm., greatest width 0.66 mm. (or a little less, as the carapace may be somewhat flattened from mounting); posterior width 0.64 mm. Tergites a little deeper brown than the carapace; interscutal areas subpapillose and not pigmented; each tergal half with five to eight distinctly clavate setae. Sternites almost smooth, brown in color, all except the tenth divided and with scuta well separated; tergite 4 with nine setae; maximum number of setae on any sternal half is 10; all sternal setae acuminate. Pleural membranes with wavy, almost papillose, striations; each anterior stigmatic plate with three setae, each posterior plate with two.

**Chelicera.**—Yellow in color; fairly stout; palm of hand with netlike markings; longest flagellar seta serrate along almost the entire anterior edge. Fixed finger with two or three weak and rounded denticles on the inner margin of the apical tooth and two

strong and one or two very weak denticles on the inner finger margin near the distal end; lamina exterior evenly convex. Movable finger stout, fig. 36E; subapical lobe located near the base of the apical tooth; galeal seta not reaching to the tip of the galea; galea fairly stout and straight, with apparently six simple rami in the distal half; serrula exterior of 17 ligulate plates; movable finger about 0.16 mm. in length.

**Palp.**—Fig. 36C. Maxilla with numerous acuminate setae and with all except the ventral face moderately granulate; the trochanter, femur, and tibia weakly to moderately granular and with numerous clavate setae, the setae ranging from strongly clavate on the trochanter and femur to weakly clavate on the extensor surface of the tibia; chela weakly granulate on the flexor surface, setae more clavate on the flexor than on the extensor surface; fingers almost smooth and with numerous acuminate setae. Maxilla 0.34 mm. long, 0.24 mm. wide. Trochanter with very globose protuberances, little elevated; pedicle almost as long as wide; 0.34 mm. long, 0.205 mm. wide. Femur with pedicle well separated from the rest of the segment and a little wider than long; flexor margin weakly convex except on the distal one-third; extensor margin a little convex; 0.48 mm. long, 0.21 mm. wide. Tibia with a stout pedicle; flexor margin bulging in the center but flattened beyond; extensor margin flatly convex in the central portion; setae much less clavate on the extensor than on the flexor surface; 0.48 mm. long, 0.22 mm. wide. Chela with pedicle near center of base; extensor margin flatly convex, flexor margin much more convex; fingers slender and gently curved; chela, without pedicle, 0.85 mm. long, 0.31 mm. wide; hand, without pedicle, 0.415 mm. long, 0.3 mm. deep; movable finger 0.455 mm. long. Viewed laterally, fig. 36A, chelal hand fairly stout, pedicle displaced a little toward the ventral side; ventral margin little convex, dorsal margin more convex; basal margin rounded; the fixed finger nearly straight, the movable finger a little curved. Tactile seta as shown in the figure. Fixed chelal finger with a reduced venedens, fig. 36B, and a short vestigial venom duct; nodus ramosus of movable finger between one and two areolar diameters basad from tactile seta *t*; marginal teeth of both fingers contiguous and cusp-bearing, between 30 and 35 in number; three or four internal

and the same number of external accessory teeth on each finger.

**Legs.**—Setae of legs variable; those of the extensor surface of segments chiefly clavate, others subclavate to acuminate; segments apparently smooth. First leg with pars basalis 0.122 mm. deep; pars tibialis with both margins evenly convex, 0.113 mm. deep; entire femur with most setae subclavate to clavate, 0.34 mm. long; tibia stout and very weakly S-shaped, 0.247 mm. long, 0.087 mm. deep; tarsus with setae of extensor surface acuminate, extensor margin nearly straight, flexor margin very weakly convex, deepest in the basal third and tapering a little toward the distal end, 0.27 mm. long, 0.065 mm. deep. Fourth leg with setae of the trochanter, the pars basalis, and the flexor surface of the tarsus acuminate; setae of the extensor surface of the tibia and tarsus strongly clavate; setae of the flexor surface of the pars tibialis and tibia weakly clavate to acuminate; pars basalis 0.145 mm. deep; entire femur with the flexor margin evenly and weakly convex, the extensor margin well rounded and evenly convex, margins of the two femoral parts continuous; entire femur 0.46 mm. long, 0.155 mm. deep; tibia much more slender than that of the first leg and a little S-shaped, 0.365 mm. long, 0.095 mm. deep; tarsus narrowing gradually toward the distal end, 0.305 mm. long, 0.07 mm. deep; a subactile clavate seta longer than the other investing setae located toward the distal end of the extensor margin of the tarsus.

**Genital Complex.**—Posterior margin with 10 setae forming a single row; anterior operculum with about 20 setae irregularly arranged in a group antieriad to the genital aperture.

**MALE.**—The single known male, the allotype, not in a favorable condition or position for study, having been mounted in an undissected condition by Ewing. As near as can be determined, structural details are identical in the two sexes except that the chela is a little stouter and the tactile seta *st* of the movable chelal finger is relatively closer to *t* and farther from *sb* in the male. Measurements secured from the male as follows: carapace 0.65 mm. long, 0.67 mm. wide; palpal trochanter 0.34 mm. long and 0.205 mm. wide; femur 0.49 mm. long, 0.21 mm. wide; tibia 0.48 mm. long, 0.215 mm. wide; chela exclusive of pedicle 0.85 mm. long and 0.32 mm. wide; chelal hand ex-

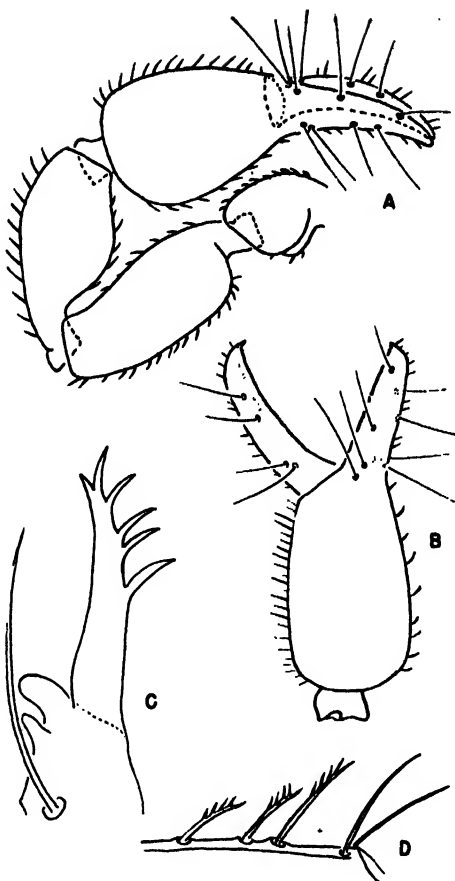


Fig. 37.—*Reginachernes lymphatus*. A, dorsal view of palp, holotype ♀; B, lateral view of chelal hand, allotype ♂; C, tip of movable chelicerall finger, holotype ♀; D, apical setae of extensor surface of tarsus IV, holotype ♀.

clusive of pedicle about 0.4 mm. long, movable finger 0.46 mm. long. Fourth leg with entire femur 0.46 mm. long, 0.15 mm. deep; tibia 0.36 mm. long, 0.09 mm. deep; tarsus 0.31 mm. long and 0.07 mm. deep. Details of genital complex not discernible in specimen.

**Holotype, female.**—Muncie, Illinois, Sept. 19, 1943, H. H. Ross.

**Allotype, male.**—Arcola, Illinois, July 21, 1909, H. E. Ewing (mcz).

The holotype was collected from leaf mold and the allotype was secured from beneath the bark of an oak tree.

*Reginachernes lymphatus* new species

*Reginachernes lymphatus*, figs. 37A-37D, may be separated from *ewingi* by characters

given in the key. The palp of *lymphatus* has considerable similarity to the palp of *Chelanops corticis* Ewing, as figured by Ewing (1911, fig. 9). Our form, however, differs in many ways from the text description given by Ewing with respect to the cheliceral galea, the investing setae of the palps, and other details. There is a possibility that some of these characters may have been misinterpreted, in which case *lymphatus* may really be *corticis*. To date the type material of *corticis* has not been located; so its identity cannot be established.

**FEMALE.**—Observations and measurements are based upon the female holotype and one female paratype unless otherwise indicated. Body and legs light brown, palps golden brown; body stout; length of body (four females measured) between 2.4 and 2.6 mm., the holotype with the abdomen contracted measuring only 1.95 mm. Carapace stout; anterior half with rounded margins, posterior portion with sides almost parallel; surface moderately to coarsely granular, appearing more weakly granular on the dorsal surface; setae scattered, fairly numerous, distinctly clavate; posterior transverse furrow much closer to the posterior carapacic margin than to the median furrow; posterior carapacic margin with 10 to 12 clavate setae; eye spots not observed; length of carapace about 0.85 mm., greatest width about 0.75 mm. Tergites of abdomen brown in color, all divided except the eleventh, with the interscutal membranes very rugose; tergites fairly granular; setae clavate, usually seven setae on each scutum of first tergite and eight setae on each scutum of the second tergite, maximum number of setae on any tergal half is 11. Sternites 4 through 10 divided; interscutal spaces striate and rugose; sternal scuta brown in color, marked by scalelike lines; each half-sternite of the fourth abdominal segment with four to six acuminate setae; maximum number of setae on any sternal half is 17. Pleural membranes very rugose; each anterior stigmatic plate with two setae, posterior plate with one; abdomen stout, usually about 1.5 mm. long, about 1 mm. wide.

**Chelicera.**—Fairly stout; palm of hand with netlike markings; subbasal seta with a few minute terminal and subterminal denticulations; longest flagellar seta unilaterally serrate, the serrations minute and widely spaced; length of chelicera 0.22–0.24 mm., width of base 0.13 mm. Fixed finger slen-

der; lamina exterior well developed and evenly convex; inner margin of apical tooth with three small denticles, inner margin of finger with two strong and two weak denticles near the distal end. Movable finger, fig. 37C, fairly stout; subapical lobe inserted near the base of the apical tooth and much distad from the insertion of the galeal seta; one or two minute denticles on the inner finger margin near the level of the insertion of the galeal seta; galeal seta not reaching to the tip of the galea; galea fairly stout, with six simple and distally acute rami confined to the distal one-half of the galea; serrula exterior of 17 or 18 ligulate plates; length of movable cheliceral finger about 0.19 mm.

**Palp.**—Fig. 37A. Measurements and ratios of the palpal femur, tibia, and chela (except the depth) given as the range of four individuals (the holotype and three female paratypes), of which two are in alcohol. Stout, fairly deep brown to reddish or golden brown in color; the sides of the maxilla and the entire trochanter and femur moderately to coarsely granular; the flexor surface of the tibia moderately granular; the flexor surface of the chelal hand weakly to moderately granular; setae of the trochanter and the flexor surfaces of the femur and tibia heavy and chiefly clavate; setae of the extensor surface of the femur and tibia less strongly clavate and sometimes paucidenticulate; setae of the flexor surface of the chelal hand subclavate, those of the extensor surface paucidenticulate; setae of the fingers acuminate. Maxilla about 0.4 mm. long and 0.3 wide. Trochanter in strict dorsal view very stout; subdorsal protuberance rounded and not much elevated; trochanter of female paratype 0.42 mm. long, 0.24 mm. wide. Femur with pedicle little longer than wide; extensor margin of femur very flatly convex, flexor margin weakly convex in the basal two-thirds but weakly concave beyond; measured along the extensor margin 0.63–0.64 mm. long, 0.255–0.27 mm. wide, length 2.35 to 2.5 times the width. Tibia with extensor margin slightly flattened in the central portion; flexor margin bulging and convex except at the extreme distal end where the margin is flattened or very slightly concave; 0.6–0.63 mm. long, 0.28–0.29 mm. wide, length between 2.1 and 2.2 times the width. Chela with margins evenly convex, the flexor margin a little more convex than the extensor; base of hand

rounded; fingers fairly slender and somewhat curved; chela, without pedicle, 0.99–1.02 mm. long, 0.37–0.38 mm. wide, length between 2.65 and 2.75 times the width; chelal hand exclusive of pedicle 0.52–0.55 mm. long, about 0.33 mm. deep (depth determined for the hand of only one female); movable finger 0.5–0.53 mm. long. Viewed laterally, the base of the chelal hand appears rounded, the margins weakly convex, and the pedicle displaced a little toward the ventral side; the fixed finger nearly straight, the movable finger a little curved and appearing weakly granulate on the exterior surface. Tactile setae of chelal fingers as shown for the male, fig. 37B; nodus ramosus of movable chelal finger varying from a position about midway between tactile setae *t* and *st* to a position much closer to *st* than to *t*. Each finger with about 40 contiguous, conical, cusp-bearing marginal teeth; accessory teeth somewhat variable, usually 8 to 10 in the external row of each finger and 1 to 4 in the internal row; end of fixed finger with a very poorly developed venedens containing a vestigial duct.

*Legs*.—Measurements relative to the holotype are followed in parentheses by the corresponding measurements of the mounted female paratype whenever the two show a significant difference. Legs usually light brown in color; femoral parts and tibiae weakly granular, granules not easily observed except on the pars tibialis; setae of the extensor surface of the segments and in part setae of flexor surfaces of femora subclavate to paucidenticulate; setae of the flexor surfaces of the tibia and tarsus acuminate and more numerous. First leg with pars basalis 0.152 (0.16) mm. deep; pars tibialis 0.14 mm. deep; entire femur 0.44 mm. long, length 2.88 (2.75) times the depth; tibia stout, deepest near the distal one-third, 0.3 (0.315) mm. long, 0.102 mm. deep; tarsus tapering a little toward the distal end, subcylindrical, about 0.295 mm. long, 0.065 (0.068) mm. deep. Fourth leg with pars basalis 0.182 (0.175) mm. deep; pars tibialis 0.205 (0.192) mm. deep; femur with extensor margin evenly convex, flexor margin very weakly convex to straight, length of entire femur 0.595 (0.61) mm., length 2.9 (3.17) times the depth; tibia much more slender than in the first leg, flexor margin a little convex, extensor margin straight to a very little concave; tibia 0.46 (0.48) mm. long, 0.12 (0.114) mm.

deep; tarsus subcylindrical but tapering a little toward the distal end, 0.34 (0.35) mm. long, 0.084 mm. deep; the extensor margin of the tarsus with a denticulate pseudotactile seta, fig. 37D, longer than the denticulate investing setae and located 0.2–0.22 mm. from the proximal margin of the tarsus.

*Genital Complex*.—About 12 to 15 marginal setae on the posterior operculum; nearly 20 setae grouped anterior to the aperture on the anterior operculum.

*MALE*.—Unless otherwise indicated, description and measurements are based upon the male allotype. Body and carapace much as in the female; a few more setae on the fourth sternal halves and a few less on the central sternal halves than in the female; body of allotype 2.4 mm. long, of one paratype 2.15 mm. long; carapace and abdomen as in the female.

*Chelicera*.—As in the female.

*Palp*.—Chaetotaxy and sculpturing, as well as the general appearance, much as in the opposite sex except setae may be a little heavier and the palpal femur and chela appear to be a very little stouter. Measurements based on two individuals (one in alcohol), the measurements of the male allotype followed in each instance by the corresponding measurement of the male paratype, whenever a measurement was secured for the latter. Maxilla 0.38 mm. long, about 0.3 mm. wide; trochanter 0.43 mm. long, 0.25 mm. wide; femur measured along the extensor margin 0.64 (0.6) mm. long, 0.27 (0.255) mm. wide; tibia 0.63 (0.6) mm. long, 0.295 (0.285) mm. wide; chela exclusive of pedicle 1.06 (0.97) mm. long, 0.407 (0.38) mm. wide; chelal hand exclusive of pedicle 0.55 (0.51) mm. long, 0.355 mm. deep; movable finger 0.545 (0.51) mm. long. Tactile setae, fig. 37B, and teeth of the chelal fingers much as in the female.

*Legs*.—Essentially as in the female; measurements secured only from the allotype. First leg with pars basalis 0.15 mm. deep, pars tibialis 0.14 mm. deep; entire femur 0.44 mm. long; tibia 0.308 mm. long, 0.103 mm. deep; tarsus 0.285 mm. long, 0.065 mm. deep. Fourth leg with pars basalis 0.164 mm. deep, pars tibialis 0.183 mm. deep; entire femur 0.595 mm. long; tibia 0.465 mm. long, 0.118 mm. deep; tarsus 0.345 mm. long, 0.084 mm. deep; denticulate pseudotactile seta located 0.225 mm. from proximal margin of tarsus.

*Genital Complex*.—Posterior operculum

with 24 scattered setae, some of which are arranged along the posterior margin, and four smaller setae just posteriad to the posterior rim of the aperture; anterior operculum with 24 scattered setae.

**TRITONYMPH.**—Unless indicated to the contrary, description is based on one tritonymph paratype. Lighter in color, smaller in size, and with stouter segments than in the adult. Chaetotaxy of the abdomen and carapace much as in the adult but with a slightly smaller number of setae; body about 2 mm. long.

**Chelicera.**—Much as in the adult except smaller; the denticulations of the subbasal seta almost wanting; galea more slender and the rami confined to about the distal one-third; serrula exterior of 15 or 16 ligulate plates.

**Palp.**—Chaetotaxy and sculpturing much as in the female, except the setae a little less stout, color lighter; the palpal femur a little stouter but the chela more slender than in the adult. Measurements of the femur, tibia, chela, and movable finger are the ranges secured from measuring three individuals, of which two are unmounted. Femur 0.4–0.41 mm. long, 0.195–0.2 mm. wide; tibia 0.395–0.4 mm. long, 0.205–0.21 mm. wide; chela exclusive of pedicle 0.7–0.73 mm. long, 0.25–0.255 mm. wide; movable finger 0.37–0.39 mm. long; chelal hand exclusive of pedicle in the mounted paratype 0.37 mm. long, 0.35 mm. deep. Movable finger with three tactile setae: *t* a little more than one-third of the finger length from the tip; *b* placed much as in the adult; *st* midway between *t* and *b*; *sb* wanting; nodus ramosus about one areolar diameter proximad from the level of tactile seta *t*. Fixed finger with tactile setae much as in the adult except *ist* is wanting and *it* is relatively a little farther from the level of *et*. Each finger with between 25 and 30 marginal teeth; each external row of accessory teeth with three to five teeth, internal row represented by one or two teeth; fixed finger with weakly developed venedens and vestigial duct.

**Legs.**—Lighter in color, less sclerotic, and with fewer setae than in the adult; segments stouter; tarsi more narrowed distally; fourth tarsus with the denticulate pseudotactile seta as described for the adult. Measurements not secured.

**DEUTONYMPH.**—Description based on one individual. Smaller, lighter in color, and

with appendages stouter than in the tritonymph; most tergal scuta with five or six clavate setae; anterior stigmatic plate appears to have but one seta; length of body about 1.4 mm.

**Chelicera.**—Smaller than in the tritonymph; subbasal seta simple; galea with probably three rami, terminal and subterminal in position.

**Palp.**—Segments much smaller, lighter in color, and with fewer and slightly weaker setae than in the tritonymph; general shape very similar in the tritonymph and the deutonymph. Measurements of one deutonymph follow: femur 0.28 mm. long, 0.145 mm. wide; tibia 0.28 mm. long, 0.15 mm. wide; chela exclusive of pedicle 0.53 mm. long, 0.185 mm. wide; chelal hand exclusive of pedicle 0.275 mm. long, 0.175 mm. deep; movable finger 0.27 mm. long. Viewed laterally, dorsal margin of chelal hand appears much more convex than the ventral margin. Movable finger with two tactile setae; one, probably *st*, a little distad from the mid-point of the finger and about one areolar diameter proximad from the level of the nodus ramosus; *b* as in the tritonymph. Setae of the fixed finger considerably different from those of the tritonymph; *it* near the mid-point of the finger or a little proximad from the mid-point; *et* about midway between the finger tip and *it*; *est* about as far from the finger base as *it* is from the finger tip; *ib* a little proximad from the level of *isb*; *esb* apparently wanting; *eb* basad from the level of *ib*. Marginal teeth of the chelal fingers much as in the tritonymph except cusps less well developed; accessory teeth wanting except for a single internal accessory tooth near tip of fixed finger.

**Legs.**—Much like the legs of the tritonymph except less sclerotic, much smaller, and with many segments probably a little stouter. Pseudotactile seta of the fourth pedal tarsus denticulate in the mounted deutonymph.

**Holotype, female.**—Urbana, Illinois: Brownfield Woods, Oct. 21, 1933, H. H. Ross.

**Allotype, male.**—Mooseheart, Kane County, Illinois: Sept. 24, 1940, Henry Dybas (CM).

**Paratypes.**—ILLINOIS. AURORA: Sept. 4, 1939, Henry Dybas, 4 tritonymphs, 2 deutonymphs (CM); April, 1940, 1 ♂, 1 ♀, 2 tritonymphs (CM). MOOSEHEART: same data as for allotype, 2 ♀ (CM).

The holotype was taken from soil-cover samples in oak-hickory woods.

### 17. *PSEUDOZAONA* Beier

*Pseudoxaona* Beier (1932c, p. 182; 1933, p. 542). Genotype, by original designation, also monobasic: *Pseudoxaona communis* Beier. *Pseudoxaona* Beier. Hoff (1947, p. 539).

Carapace longer than wide, with two transverse furrows. Setae of body and palps toothed, usually subclavate to clavate. Flagellum with four setae. Palps slender, figs. 38A, 38C, the pedicle of the femur not well set off from the rest of the segment. The tactile seta *ist* placed distad from *est* on the fixed chelal finger; *st* between *t* and *sb* or a little closer to *t* than to *sb* on the movable chelal finger. Legs moderately slender; tarsus of fourth leg without a tactile seta.

This genus, which has not been reported from Illinois, can be recognized by characteristics given in the key. It contains the genotype, *communis*, from Mexico; *uniformis* (Banks), from Costa Rica; and *mirabilis* (Banks), from the eastern United States, where it has been taken from caves in Kentucky and Virginia. Diagnostic char-

acters are illustrated in figs. 38A-C; a more nearly complete description has been given previously by the writer (Hoff 1946f).

### 18. *DINOCHIRUS* Chamberlin

*Dinocheirus* Chamberlin (1929a, p. 171). Genotype, monobasic: *Dinocheirus tenoch* Chamberlin.

*Dinocheirus* Chamberlin. Chamberlin (1934, p. 126), Hoff (1947, p. 513).

DIAGNOSIS.—Carapace with two well-developed transverse furrows; usually no eye spots. Cheliceral hand with five setae, the basal seta acuminate, the subbasal seta subterminally denticulate; galea of male commonly less branched than the galea of the female; flagellum of chelicera with four setae. Palps moderately stout; chela of male usually stouter and larger than that of the female; well-developed accessory teeth present on the chelal fingers; nodus ramosus of movable finger between *t* and *st*; *st* closer to *t* than to *sb* and *t* closer to *st* than to the finger tip; *ist* commonly a little distad from *est*, fig. 39B. Tarsus of fourth leg with an acuminate or pseudotactile acuminate seta located distad from the mid-point of the extensor surface and longer than the

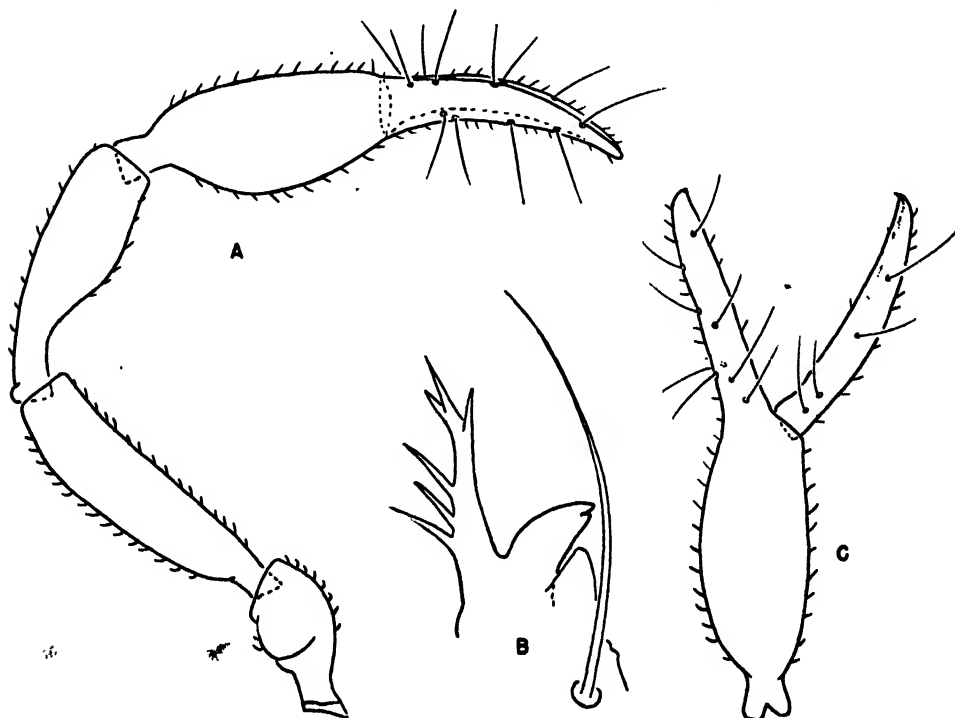


Fig. 38.—*Pseudoxaona mirabilis* ♂. A, palp, dorsal view. B, end of movable finger of chelicera; C, chela, lateral view (teeth omitted).

depth of the tarsus. Seminal receptacle of the female paired, very elongate, tubular, with a terminal ovate sac.

Two species have been collected in Illinois. Several others are known from the Atlantic states and from the West and Southwest.

#### KEY TO SPECIES

Palpal femur with length more than 0.6 mm.  
and more than 2.5 times the width.....*pallidus*  
.....*pallidus*  
Palpal femur with length less than 0.6 mm.  
and less than 2.5 times the width.....*solus*

#### *Dinocheirus pallidus* (Banks) new combination

*Chernes pallidus* Banks (1890, p. 152).

*Hesperochernes pallidus* (Banks). Hoff (1947, p. 509).

Ewing (1911) listed *Chelanops pallidus* from Arcola and from Marshall, Illinois. A study of some of the specimens assigned by Ewing to this species indicates an incorrect determination, which is also evident when his figure (Ewing 1911, fig. 11) is compared with the lectotype of *pallidus* at the Museum of Comparative Zoology. Ewing's available specimens of *pallidus* are really *Parachernes squarrosus* new species, as noted under this latter species.

Diagnostic characters for *pallidus* are given in fig. 39. The male has not been described previously. Three specimens of this sex were taken in an Arkansas collection along with a female that agrees closely with the lectotype at the Museum of Comparative Zoology.

**MALE.**—Description and measurements based on four males, one from Illinois and three from Arkansas. Body fairly stout, yellowish to light brown in color; palps reddish-brown; body length 2.55–2.75 mm. Carapace granular; setae clavate and fairly numerous; anterior half of carapace rounded, posterior portion of sides subparallel; posterior margin with 12 to 15 irregularly placed marginal setae; no eye spots; carapace 0.88–0.96 mm. long, 0.6–0.8 mm. wide near the center; posterior width a little less than the greatest width. Tergites of abdomen except the eleventh divided but first tergite sometimes very weakly divided; setae clavate; each first tergal scutum with 9 or 10 setae, central tergal halves with as many as 14 setae; tergal scuta moderately granular. Sternites 4 through 10 divided, marked by scalelike markings; each half-sternite 4 with four setae; maximum number of setae

on any sternal half about 12, usually somewhat less; setae acuminate to subacuminate and paucidenticulate. Pleural membranes with fine wavy striations; each stigmatic plate with one or two (rarely three) setae, somewhat variable; abdomen 1.65–1.8 mm. long, about two-thirds as wide as long.

**Chelicera.**—Fairly stout, deep yellow in color; palm of hand with a few netlike markings; subbasal seta denticulate, basal seta acuminate; length of chelicera 0.24–0.25 mm., width of base 0.135–0.165 mm., movable finger 0.2–0.23 mm. long. Fixed finger slender; two or three small denticles on the inner margin of the apical tooth and four or five denticles on the inner margin of the finger near the distal end. Movable finger, fig. 39C, little curved; apical tooth often weakly bicuspid; subapical lobe weakly bicuspid or tricuspid, often a weak denticle on the finger margin near the insertion of the galeal seta; gelea slender and with five or six acutely pointed, short rami confined to the distal one-third; galeal seta not reaching to the level of the tip of the galea; serrula exterior of 17 or 18 ligulate plates.

**Palp.**—Fig. 39A. Moderately stout; granular except the face of the maxilla, the extensor surface of the tibia and the chelal hand, and the fingers; setae of maxilla acuminate; setae of the trochanter and femur subclavate and multidenticulate, those of the tibia multidenticulate but somewhat slender and especially on the extensor surface not subclavate; setae of the chelal hand weakly multidenticulate to paucidenticulate, those of the fingers acuminate. Maxilla 0.45–0.53 mm. long, 0.27–0.32 mm. wide. Trochanter with a stout subdorsal protuberance; length 0.38–0.45 mm., 1.4 to 1.6 times the width. Femur with pedicle about as long as wide; extensor surface of femur weakly and somewhat flatly convex; flexor surface weakly convex except a little concave near the distal end; 0.77–0.88 mm. long, 0.27–0.31 mm. wide; length 2.75 to 3.25 times the width. Tibia with extensor margin somewhat flatly convex; flexor margin convex near the center but somewhat concave beyond; 0.76–0.8 mm. long, 0.29–0.34 mm. wide; length 2.45 to 2.65 times the width. Chela as viewed from the dorsum with the extensor, flexor, and basal margins more or less evenly convex; in general the chelal hand is elongate-oval, tapering somewhat toward the base of the fingers, and widest in the basal half; chelal fingers

slender, gently and evenly curved; chela exclusive of pedicle 1.22–1.36 mm. long, 0.43–0.52 mm. wide, length 2.6 to 3.0 times the width; chelal hand exclusive of pedicle

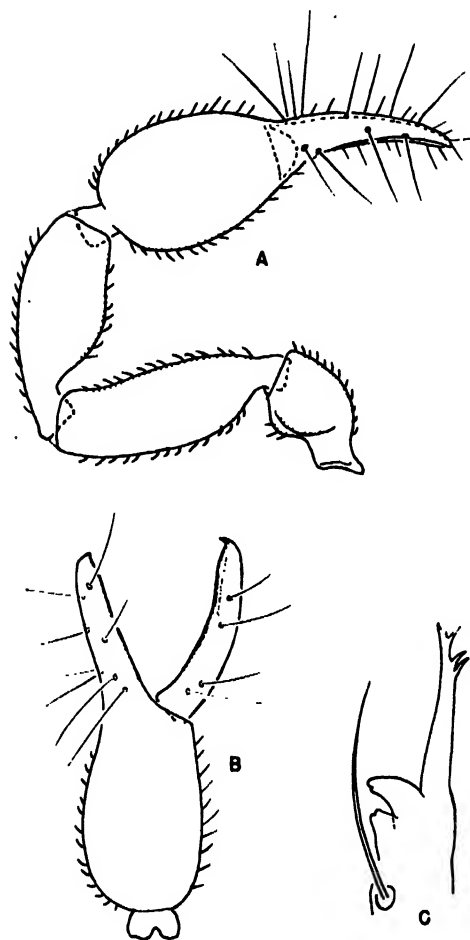


Fig. 39.—*Dinocheirus pallidus* ♂. A, dorsal view of palp; B, lateral view of chela; C, end of movable cheliceral finger.

0.64–0.69 mm. long, 0.4–0.52 mm. deep, usually 4.5 mm. or less; movable finger between 0.63 and 0.72 mm. long, usually 0.7 mm. or more. Viewed laterally, fig. 39B, chelal hand fairly stout, extensor and flexor margins moderately convex but hand tapering little toward base of fingers; basal margin flatly convex, with the pedicle displaced somewhat toward the ventral side; movable finger markedly convex, especially near the center; fixed finger variable, either nearly straight or with the inner margin convex and the outer margin distinctly concave;

fingers gapping when closed. Tactile setae as shown in the figure. Fixed finger with a vestigial venedens and a short nonfunctional venom duct. Marginal teeth of chelal fingers contiguous and cuspid, between 35 and 45 on each finger; each finger usually with two (occasionally only one) to four internal and six to eight external accessory teeth. Nodus ramosus of movable chelal finger located between tactile seta *t* and *st*, usually much closer to the latter than to the former.

**Legs.**—Legs slender; setae multidenticulate to paucidentate on the extensor surface of segments, paucidentate on the flexor surface of segments except acuminate on the flexor surface of the tarsi; femora and tibiae weakly granular or sculptured by netlike markings. First leg with trochanter 0.16–0.18 mm. long, length 1.1 to 1.13 times the width; pars basalis 0.16–0.18 mm. deep; pars tibialis 0.145–0.16 mm. deep, with both margins very weakly convex; entire femur 0.56–0.65 mm. long, length 3.1 to 3.6 times the depth; tibia slender, flexor margin weakly convex, 0.41–0.49 mm. long, 0.1–0.11 mm. deep, length 3.9 to 4.5 times the depth, length usually 4.3 or more times the depth; tarsus very slender, subcylindrical, tapering a little toward the distal end, 0.4–0.45 mm. long, 0.065–0.075 mm. deep, length 5.7 to 6.4 times the depth. Fourth leg with pars basalis 0.2–0.21 mm. deep; pars tibialis 0.23–0.24 mm. deep; entire femur with evenly convex extensor margin, flexor margin virtually straight except at the ends, 0.72–0.82 mm. long, length 3.0 to 3.4 times the depth; tibia with weakly convex flexor margin, extensor margin nearly straight except at the basal end, 0.6–0.7 mm. long, 0.13–0.145 mm. deep, length 4.5 to 4.9 times the depth; tarsus tapering a little toward the distal end, 0.45–0.50 mm. long, 0.08–0.09 mm. deep, length 5.35 to 5.75 times the depth; short tactile seta on the extensor surface 0.32–0.37 mm. from the proximal end of the tarsus.

**Genital Complex.**—Posterior operculum with about 25 setae, many of which form an irregular marginal row, and with 6 to 8 setae along the very posterior rim of the aperture; anterior operculum very setaceous, with between 50 and 60 setae more or less scattered over the face of the operculum.

**FEMALE.**—The two available females, one from Illinois and one from Arkansas, are



essentially like the male and also very similar in detail to the female lectotype previously described (Hoff 1947). Some of the minor discrepancies noticed between the present females and the lectotype can be attributed to the poorly preserved and somewhat broken condition of the lectotype. None of the differences are of sufficient value to justify even subspecific segregation. Measurements are given to show some of the species variations that occur. The measurement of the single available female from Illinois is followed in each instance by the corresponding measurement of the female from Arkansas. Female length 3.35 (2.98) mm.; carapace 1.1 (1.01) mm. long, 0.83 (0.675) mm. wide; abdomen about 2.3 (1.86) mm. long, 1.8 (1.25) mm. wide; chelicera 0.26 (0.255) mm. long, 0.155 (0.145) mm. wide across the base, movable finger 0.21 (0.21) mm. long. Palp with maxilla 0.51 (0.51) mm. long, 0.35 (0.34) mm. wide; trochanter 0.51 (0.48) mm. long, 0.3 (0.32) mm. wide; femur measured along the extensor margin 0.88 (0.88) mm. long, greatest over-all length 0.94 (0.95) mm., width 0.305 (0.29) mm.; tibia 0.84 (0.785) mm. long, 0.335 (0.315) mm. wide; chela exclusive of pedicle 1.44 (1.44) mm. long, 0.52 (0.495) mm. wide; chelal hand exclusive of pedicle 0.75 (0.735) mm. long, 0.53 (0.485) mm. deep; movable finger 0.78 (0.77) mm. long. First leg with pars basalis 0.182 (0.178) mm. deep; pars tibialis 0.155 (0.152) mm. deep; entire femur 0.65 (0.625) mm. long; tibia 0.48 (0.465) mm. long, 0.106 (0.103) mm. deep; tarsus 0.45 (0.46) mm. long, 0.068 (0.076) mm. deep. Fourth leg with pars basalis 0.228 (0.225) mm. deep; pars tibialis 0.25 (0.246) mm. deep; entire femur 0.85 (0.83) mm. long; tibia 0.68 (0.69) mm. long, 0.136 (0.133) mm. deep; tarsus 0.49 (0.495) mm. long, 0.091 (0.092) mm. deep; tactile seta 0.34 (0.38) mm. from the proximal margin of the tarsus.

**TRITONYMPH.**—Very similar in most ways to the adult but lighter in color, much smaller in size, and with some segments, especially those of the legs, stouter. Movable chelal finger with three tactile setae: *b* (or *sb*?) wanting; *t* a little distad from the mid-point of the finger; *st* about as far from the finger base as *t* is from the tip; *sb* (or *b*?) as in the adult; nodus ramosus a little proximad from the level of tactile seta *t*. Fixed finger with tactile setae much

as in the adult except *ist* is wanting. Important measurements of the tritonymph are given here. Body about 2.45 mm. long; carapace 0.78 mm. long, 0.58 mm. wide. Chelicera 0.22 mm. long, 0.13 wide; movable finger 0.175 mm. long. Palp with the trochanter 0.32 mm. long, 0.21 mm. wide; femur 0.59 mm. long, 0.225 mm. wide; tibia 0.55 mm. long, 0.25 mm. wide; chela exclusive of pedicle 1.03 mm. long, 0.345 mm. wide; chelal hand exclusive of pedicle 0.53 mm. long, 0.35 mm. deep; movable finger 0.54 mm. long. First leg with entire femur 0.43 mm. long, depth across pars basalis 0.152 mm.; tibia 0.308 mm. long, 0.087 mm. deep; tarsus 0.34 mm. long, 0.065 mm. deep. Fourth leg with entire femur 0.61 mm. long, 0.192 mm. deep across the pars tibialis; tibia 0.48 mm. long, 0.114 mm. deep; tarsus 0.38 mm. long, 0.084 mm. deep.

**DISTRIBUTION.**—This species, originally described from Ithaca, New York, has been taken in two collections from northern Illinois. In addition, three males, one female, and one tritonymph were secured by M. W. Sanderson on April 13, 1940, at Lake Wedington Wildlife Area, Washington County, Arkansas.

The Illinois collection from Magnolia came from a decayed log, and the Arkansas specimens were taken from debris in a hollow tree on a wooded hillside.

**Illinois Records.**—A single male was taken in a collection made by Henry Dybas at Palos Park, Cook County, Illinois, on May 16, 1943, and a single female was taken at Magnolia, Putnam County, Illinois, on March 23, 1944, by H. H. Ross.

#### *Dinocheirus solus* new species

Specimens of *Dinocheirus solus*, figs. 40A, 40B, differ from those of many species of the genus *Dinocheirus* by their much smaller size. This new species appears to be closely related by size and general structure to *dorsalis* (Banks), from which it is readily separated by small differences in the shape of some of the palpal segments, the length and position of the tactile seta of the fourth pedal tarsus, and numerous other details.

**MALE.**—Body ovate, fairly stout; yellow to yellowish-brown in color, with the palps a deeper golden brown; length of body 2.1 mm. Carapace rounded anteriorly, sides convex; widest across the center; furrows well marked; eyes apparently wanting; posterior carapacic margin with 12 setae; all

setae of carapace weakly to strongly clavate; sides of carapace moderately granular, dorsal face virtually smooth; length of carapace 0.73 mm., greatest width 0.7 mm., posterior width 0.66 mm. Tergites of abdomen weakly granular and with scalelike markings, all divided except the last; intertergal spaces wide; setae of tergites clavate and with as many as 12 setae on some of the central tergal halves. Sternites 4 to 10 inclusive divided; fourth sternal halves each with four or five setae, central sternal halves each with 11 or 12 setae; all setae of sternites acuminate; sternites with scalelike sculpturing; pleural membranes striated and rugose; abdomen about 1.35 mm. long, 1.12 mm. wide.

**Chelicera.**—Base fairly stout, fingers relatively slender and slightly curved; subbasal seta subterminally denticulate, basal seta acuminate; length of chelicera 0.2 mm., width of base 0.125 mm. Fixed finger a little curved, with five or six weakly developed teeth on the distal inner margin in addition to three denticles on the inner surface of the apical tooth. Movable finger nearly straight; subapical lobe not especially well developed; apical tooth terminally sclerotic and bicuspid; galea slender and long, with five weakly developed and short terminal and subterminal rami; serrula exterior of 17 to 18 plates; movable finger 0.175 mm. long.

**Palp.**—Fig. 40A. Fairly stout; the lateral surface of the maxilla, the extensor surface of the trochanter, and the flexor surfaces of the femur and tibia coarsely to moderately granular; other surfaces very weakly granulate to smooth; setae acuminate on the maxilla; setae of the trochanter, femur, and tibia somewhat stout and multidenticulate to paucidenticulate; setae stouter on the femur and the trochanter than elsewhere; chelal hand with setae chiefly paucidenticulate; acuminate setae on the fingers. Maxilla 0.37 mm. long, 0.27 mm. wide. Trochanter with the flexor, or inner margin, moderately convex; 0.32 long, 0.21 mm. wide. Femur moderately stout to stout, 0.56 mm. long, 0.235 mm. wide; outer margin convex, more convex near the ends than in the center; inner margin weakly convex in the basal two-thirds but a little concave in the distal one-third; the pedicle about as long as wide, well set off from the rest of the segment. Tibia with outer margin flatly rounded, inner margin bulging, but slightly

concave distad from the center; pedicle stout; 0.56 mm. long, 0.245 mm. wide. Chela with outer and inner margins more or less evenly convex, the outer a little less convex than the inner; pedicle near the center of the base; fingers slender, curved, well set off from hand; chela, pedicle excluded, 0.9 mm.

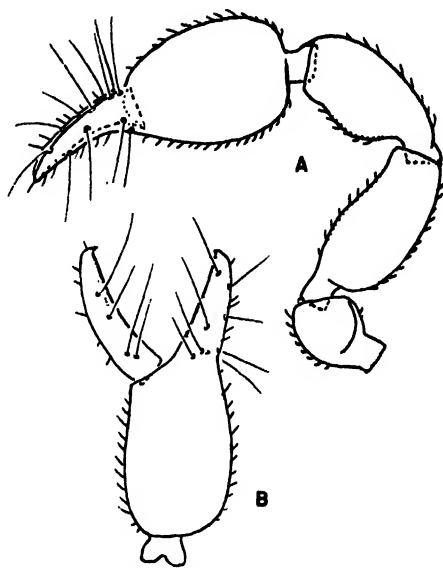


Fig. 40.—*Dinochirus solus*, holotype ♂. A, dorsal view of palp; B, lateral view of chela.

long, 0.37 mm. wide; chelal hand 0.495 mm. long, 0.34 mm. deep; movable finger of chela 0.46 mm. long. From the side, hand, fig. 40B, appears somewhat quadrangular in general outline; pedicle displaced far toward the ventral side; ventral margin weakly convex, dorsal margin more convex; fingers moderately stout, the fixed finger nearly straight, the movable finger gently curved. Each finger with about 40 marginal teeth, conical and with well-developed cusps at the distal end of the row but rounded and acuspid at the proximal end of the row; each finger with five external accessory teeth; movable finger with three, fixed finger with two, internal accessory teeth. Nodus ramosus of movable finger located just distad from the level of tactile seta *st*. Fixed finger with a vestigial venedens and a short vestigial venom duct.

**Legs.**—Somewhat slender; yellow in color; pars tibialis and flexor surface of tibia of first leg weakly granular, otherwise pedal segments smooth; setae of the extensor surface of most segments paucidenticulate, slender, not clavate; setae of the flexor sur-

face of segments chiefly acuminate. First leg with pars basalis 0.133 mm. deep; pars tibialis with both margins evenly convex, 0.114 mm. deep; entire femur 0.43 mm. long, 0.133 mm. deep; tibia with outer margin distinctly but weakly S-shaped, flexor

the extensor surface 0.25 mm. from the proximal margin of the tarsus.

**Genital Complex.**—Posterior operculum with 17 irregularly placed setae on the face of the operculum and along the posterior margin and with five setae on the posterior rim of the genital aperture; anterior operculum with 31 irregularly placed setae, of which the 4 medial ones are much longer and stouter than the others.

**Holotype, male.**—Rockford, Winnebago County, Illinois: taken from moist wheat stubble, June 12, 1944, C. L. Remington.

## 19. *HESPEROCHERNES* Chamberlin

*Hesperochnes* Chamberlin (1924, p. 89).

Genotype, monobasic: *Hesperochnes laurae* Chamberlin.

*Hesperochnes* Chamberlin. Beier (1932c, p. 174).

Cephalothorax clearly longer than wide; carapace granular with two transverse carapacic furrows. Tergites divided, granular. Palps stout, femur with well-defined pedicle. Setae of body and palps usually lightly, but clearly, clavate. Flagellum with four setae; setae *b* and *sb* of hand of chelicera thickened and denticulate. The sensory seta *ist* of the fixed chelal finger is distad from *est*; *st* of the movable chelal finger is found nearer to *t* than to *sb*. The tarsus of the fourth leg is without a true sensory seta, although a short-toothed pseudotactile seta may be present.

This is a common North American genus and is represented by a number of species from the United States, Mexico, and Canada. *H. unicolor* (Banks) has been described from Austin, Texas. Diagnostic characters are illustrated in figs. 41, 42, 43.

## 20. *ACUMINOCHERNES* new genus

**DIAGNOSIS.**—Chelicera with both tactile setae *b* and *sb* smooth and acuminate; flagellum with four setae. Palps stout, setae chiefly subclavate to clavate; some sexual dimorphism shown in palps; tactile seta *st* nearer to *t* than to *sb*; tactile seta *ist* distad from *est*, fig. 44D. Fourth leg with a tactile seta distad from the mid-point of the tarsus. Seminal receptacle of female in the form of a long slender tubule terminating in a closed bulb or sac.

**Genotype.**—*Hesperochnes crassopalpus* Hoff.

A very distinctive characteristic of this genus is the acuminate nature of both the

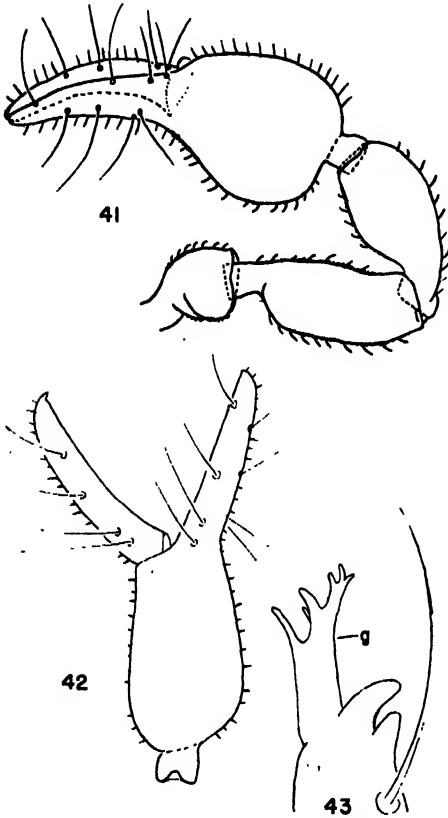


Fig. 41.—*Hesperochnes canadensis* ♂. Dorsal view of palp.

Fig. 42.—*Hesperochnes sanborni* ♂. Chela, lateral view (teeth omitted).

Fig. 43.—*Hesperochnes sanborni* ♂. Tip of movable finger of chelicera; *g*, galea.

margin convex, 0.342 mm. long, 0.088 mm. deep; tarsus tapering very little toward the distal end, 0.315 mm. long, 0.061 mm. deep. Fourth leg with pars basalis 0.14 mm. deep, pars tibialis 0.151 mm. deep; entire femur with flexor margin nearly straight, extensor margin flatly convex, 0.545 mm. long, 0.151 mm. deep; tibia slender, extensor margin very weakly S-shaped, flexor margin weakly convex, 0.46 mm. long, 0.097 mm. deep; tarsus subcylindrical, tapering very little toward the distal end, 0.355 mm. long, 0.07 mm. deep; a short tactile seta located on

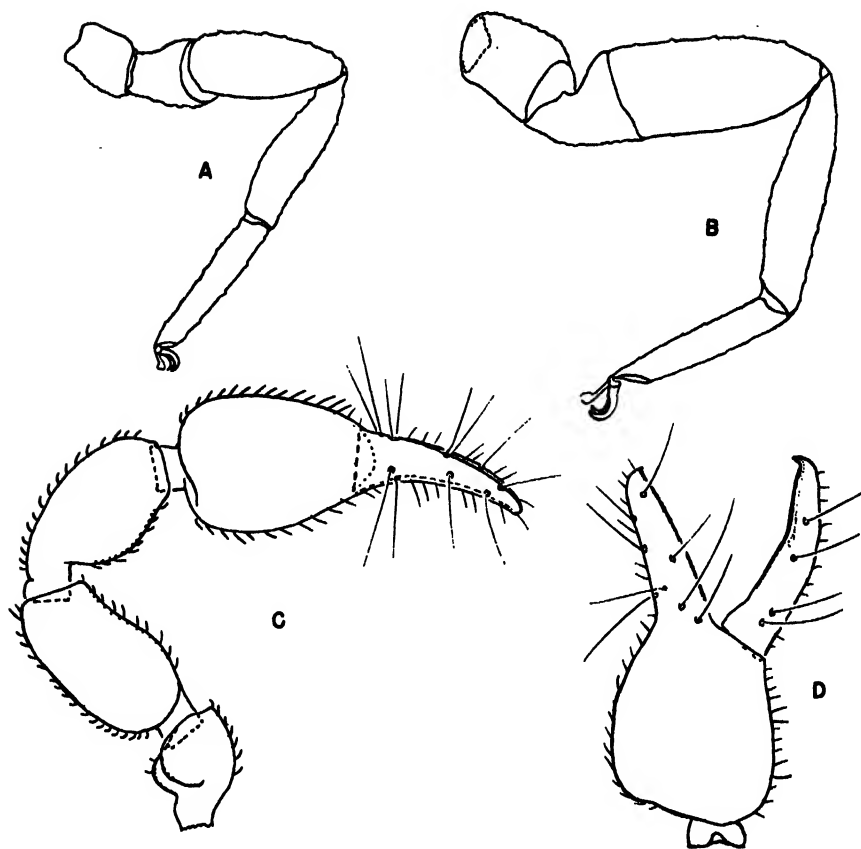


Fig. 44.—*Acuminochernes crassopalpus*. A, right leg I, ♀; B, right leg IV, ♀; C, dorsal view of palp, ♀; D, lateral view of chela, ♂.

basal and subbasal setae of the base of the chelicera. Only one species, the genotype, is known.

*Acuminochernes crassopalpus* (Hoff)  
new combination

*Hesperochernes crassopalpus* Hoff (1945a, p. 43).

Since the present species has been described in detail in a previous publication (Hoff 1945a), only measurements of the palpal segments and illustrations of chela and palp, figs. 44D, 44C, are given here. The members of this species may be recognized by generic characteristics given in the key.

**MALE.**—The following pertinent measurements are expressed as the limits of range for nine individuals. Body length 1.8–2.1 mm. Palpal femur 0.56–0.61 mm. long, 0.265–0.295 mm. wide, length 2.0 to 2.1 times the width; tibia 0.56–0.61 mm. long,

0.26–0.3 mm. wide, length 2.0 to 2.2 times the width; palpal chela without pedicle 0.96–1.05 mm. long, 0.425–0.49 mm. wide, length 2.14 to 2.3 times the width; chelal hand 0.43–0.52 mm. deep, 0.48–0.52 mm. long exclusive of pedicle; movable chelal finger 0.53–0.59 mm. long.

**FEMALE.**—The following measurements are given as the range of six females. Body length 2.0–2.35 mm. Palps with femur 0.57–0.62 mm. long, 0.255–0.27 mm. wide, length 2.2 to 2.3 times the width; tibia 0.56–0.62 mm. long, 0.255–0.28 mm. wide, length 2.15 to 2.22 times the width; chela exclusive of pedicle 0.98–1.05 mm. long, 0.38–0.41 mm. wide, length 2.5 to 2.6 times the width; chelal hand exclusive of pedicle 0.49–0.54 mm. long, 0.375–0.425 mm. deep; movable finger 0.51–0.54 mm. long.

**DISTRIBUTION.**—This species, which was previously reported only from Arkansas, has been taken in eight collections in north-cen-

tral to southern Illinois. In addition, it was taken from pack-rat nests at Lawrence, Kansas, by R. H. Beamer of the University of Kansas.

*Hesperochnes crassopalpus* often occurs in great numbers in a collection, although on some occasions it is taken singly. Of the five Illinois collections bearing habitat data, three were secured from debris in hollow trees, one was made from a decayed log, and one came from the stomach of a red-bellied woodpecker.

**Illinois Records.**—CACHE: April 19, 1944, Ross & Sanderson, 4♂. EDGEWOOD: grass pile, July 25, 1947, Sanderson & Stannard, 7♀, 10♂. GILLESPIE: Aug. 30, 1944, Clarence & Marie Goodnight, 1♀. HERRIN: July 8, 1944, W. Snow, 1 tritonymph (ws). LAWRENCE: Aug. 25, 1944, W. Snow, 1 specimen. MAGNOLIA: March 23, 1944, Ross, great numbers of ♂♂, ♀♀, and nymphs. THOMASBORO: in corn mash, Nov. 10, 1947, Cooper, 1♀, 5 immatures. URBANA: Nov. 12, 1934, A. C. Toumey, 1♀ (HJV).

## 21. MIROCHERNES Beier

*Mirochernes* Beier (1930b, p. 216; 1932c, p. 182). Genotype, by original designation and monobasic: *Chelanops dentatus* Banks.

**DIAGNOSIS.**—Chelicera with flagellum of four setae; seta *b* of base of chelicera acuminate, seta *sb* denticulate; usually two acute denticles on the inner margin of the movable finger near the level of the insertion of the galeal seta. Palps stout, the chela of the male with an internal hooklike ornament on the hand, fig. 45C; sexual dimorphism marked in the palps; setae subclavate to clavate; tactile seta *st* nearer to *t* than to *sb*; tactile seta *ist* distad from *est*, fig. 45A. Fourth leg with tactile seta distad from the mid-point of the tarsus. Female with seminal receptacle consisting of a long tubule with a saclike bulb at the end.

The generic diagnosis has been amended above to include the tactile seta on the tarsus of the fourth leg. Previously, the tactile seta was reported as wanting (Beier 1932c, Hoff 1947). The tactile seta apparently had been broken from the fourth pedal tarsus of the male lectotype previously examined by the present writer (Hoff 1947) and its presence was, as a result, not reported.

Males of this genus are easily recognized by the unusual modification of the inner surface of the chelal hand. At the present time

characters have not been found for the accurate recognition of females of this genus. The genus contains only the genotype.

### *Mirochernes dentatus* (Banks)

*Chelanops dentatus* Banks (1895, p. 6).

*Mirochernes dentatus* (Banks). Beier (1930b, p. 216, but not pp. 217–218, fig. 14; 1932c, p. 182). Hoff (1947, p. 502).

*Chernes dentatus* (Banks). Chamberlin (1931a, p. 124).

The male of this species is easily recognized by the toothlike projection on the chelal hand, fig. 45C. From related Illinois pseudoscorpions the females may be differentiated by characters given in the key. The female is described here in considerable detail, since, up to the present time, this sex has been undescribed. The females of this species appear to be much more abundant than the males. In some collections, usually mixed with specimens of other species, are nymphs probably of this species. However, since it is impossible to state with certainty that the nymphs are of *dentatus*, they are not described here.

**FEMALE.**—Measurements given represent the range of eight females. Body and legs light brown in color; palps dark reddish-brown; legs moderately slender, palps stout; body fairly stout, 2.2–3.15 mm. long. Carapace darker and more red in color than the abdomen; transverse furrows well marked; no eye spots; anterior portion of carapace rounded, sides convex; greatest width near the center, slightly narrower across the posterior margin; surface moderately to coarsely granular; setae distinctly clavate, usually 12 setae along the posterior carapacic margin; carapace 0.82–0.99 mm. long, greatest width 0.67–0.85 mm., posterior width 0.64–0.82 mm. Abdomen ovate in general outline; tergites except the eleventh divided; interscutal spaces mostly wide and conspicuously granulate; each first half-tergite with six or seven setae; central tergal halves with as many as 10 setae, all clavate; surface of tergal scuta weakly to moderately granular. Sternites very weakly sculptured, sternites 4 through 10 divided; each fourth half-sternite with three or four setae, central tergal halves with as many as 14 setae, all acuminate; interscutal spaces wide and very weakly sculptured, striate to granulate. Each anterior stigmatic plate with three setae, each posterior plate with one; pleural membranes very rugose and papillose; abdomen 1.4–2.2 mm. long, greatest width 1.05–1.6 mm.

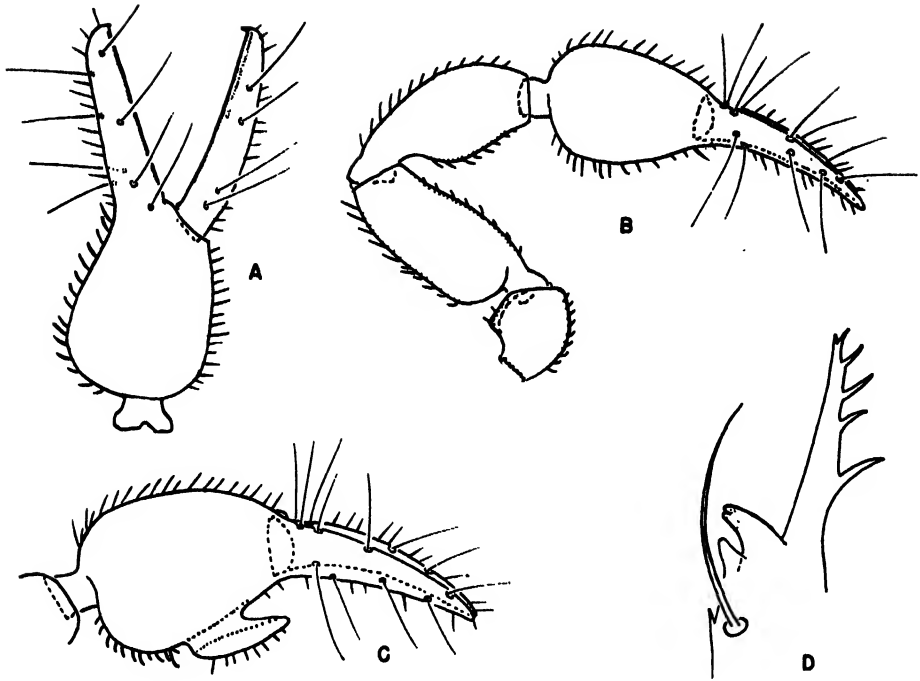


Fig. 45.—*Mirochernes dentatus*. A, lateral view of chela, ♀; B, dorsal view of palp, ♀; C, dorsal view of chela, ♂; D, tip of movable cheliceral finger, ♀.

**Chelicera.**—Fairly stout, yellow in color; exterior aspect of base of hand sculptured with netlike markings; subbasal seta terminally and subterminally denticulate, basal seta acuminate; chelicera between 0.25 and 0.3 mm. long, width of base 0.145–0.17 mm., length of movable finger 0.21–0.25 mm. Fixed finger with three denticles on the inner surface of the apical tooth and usually two large and three small denticles on the inner finger margin; lamina exterior well developed and extended as a keel along the base of the chelicera; all except the distal four plates of the serrula interior fused into a velum. Movable finger, fig. 45D, only a little curved; subapical lobe large; one or two acute but small denticles present on the inner finger margin near the level of the insertion of the galeal seta; serrula exterior of 18 to 19 plates; galeal seta reaching only about half way to the tip of the galea; galea with usually six terminal and lateral rami, all simple and arranged along little more than the terminal one-half of the galea.

**Palp.**—Fig. 45B. Surface moderately granular on trochanter and femur, tibia weakly granular except smooth on the extensor surface, the ventral face of the max-

illa and most of the chela virtually smooth; setae of maxilla acuminate, setae of the trochanter and femur subclavate, setae of the flexor surface of the tibia and chelal hand multidenticulate while those of the extensor surface of the tibia and chelal hand are paucidenticulate; setae of the fingers acuminate. Maxilla 0.43–0.51 mm. long, 0.27–0.35 mm. wide, length 1.4 to 1.6 times the width. Trochanter stout, with two well-rounded protuberances; 0.435–0.51 mm. long, 0.24–0.3 mm. wide, length 1.65 to 1.82 times the width. Femur with a cylindrical pedicle, about as long as wide; femur enlarged suddenly beyond the pedicle and slightly narrowed toward the distal end; extensor margin flatly convex in the central portion; flexor margin slightly S-shaped; femur widest near the center; femur along the extensor margin 0.6–0.75 mm. long, 0.26–0.325 mm. wide, length 2.27 to 2.34 times the width. Tibia with pedicle larger than that of the femur and about as long as wide; flexor margin rounded and bulging except flattened or a little concave near the distal end; extensor margin flatly convex except in the terminal one-third; 0.61–0.8 mm. long, 0.27–0.34 mm. wide, length

2.17 to 2.43 times the width. Chela with hand stout, fingers slender and gently curved; both extensor and flexor margins of chelal hand convex, the flexor much more so than the extensor; hand tapering rapidly toward the fingers; pedicle displaced toward the extensor side of the hand; chela exclusive of pedicle 1.07–1.33 long, 0.365–0.465 mm. wide, length 2.6 to 3.0 times the width; chelal hand exclusive of pedicle 0.48–0.6 mm. long, 0.38–0.475 mm. deep; movable chelal finger 0.625–0.78 mm. long. From the side, chelal hand, fig. 45A, appears stout; pedicle displaced far toward the ventral side; fixed finger nearly straight, movable finger usually a little curved. Marginal teeth of chelal fingers conical, contiguous, and with well-defined cusps; usually 50 to 60 marginal teeth on each finger, with slightly more on the fixed than on the movable finger; accessory teeth variable, usually two to four internal accessory teeth and six to eight external accessory teeth. Nodus ramosus of movable finger usually very near the level of tactile seta *st*. Tactile setae of chelal fingers as shown in the figure.

*Legs*.—Yellow in color; setae of the flexor surface of segments (except pars tibialis of fourth leg) chiefly acuminate, fairly long and numerous; setae of the extensor surface multidenticulate to paucidenticulate; surface of segments smooth except very weakly granular on the femoral parts of the fourth leg and sometimes on the femur of the first leg. First leg with pars basalis 0.16–0.197 mm. deep; pars tibialis slender, extensor margin weakly curved, flexor margin nearly straight to very weakly curved, 0.129–0.155 mm. deep; entire femur 0.48–0.61 mm. long, length 2.98 to 3.28 times the depth; tibia very weakly S-shaped, 0.36–0.46 mm. long, 0.093–0.114 mm. deep, length 3.85 to 4.2 times the depth; tarsus very slender, tapering a little toward the distal end, 0.37–0.45 mm. long, 0.06–0.072 mm. deep, length 5.6 to 6.6 times the depth. Fourth leg with pars basalis 0.175–0.212 mm. deep; pars tibialis 0.188–0.225 mm. deep; entire femur somewhat slender, extensor margin evenly but not strongly convex, flexor margin nearly straight, 0.63–0.8 mm. long, length 3.26 to 3.55 times the depth; tibia S-shaped with the extensor margin markedly concave in the distal two-thirds, 0.5–0.645 mm. long, 0.114–0.133 mm. deep, length 4.35 to 4.85 times the depth; tarsus tapering a little toward the distal end, 0.43–0.53 mm. long,

0.076–0.088 mm. deep, length 5.5 to 6.35 times the depth; tactile seta present on tarsus and located about two-thirds of the segment length from the proximal margin of the segment, seta short and easily broken.

*Genital Complex*.—Usually about 10 setae along the posterior margin of the posterior operculum and 18 to 22 setae scattered on the anterior operculum. Seminal receptacle with surface of bulb at end of tubule rugose or wrinkled.

*MALE*.—Description based on two Illinois males; the measurements of one are given in parentheses following the corresponding measurements of the other. Body, appendages, and most details as in the female. The chela, fig. 45C, is much stouter than in the female and bears a hooklike appendage on the subflexor surface. Body length 2.3 (2.2) mm.; carapace 0.97 (0.88) mm. long, 0.82 (0.77) mm. wide; cheliceral finger 0.25 (0.24) mm. long. Palp with maxilla 0.5 (0.49) mm. long, 0.35 (0.33) mm. wide; trochanter about 0.5 mm. long and 0.3 mm. wide; femur 0.8 (0.75) mm. long, 0.35 (0.325) mm. wide; tibia 0.83 (0.76) mm. long, 0.365 (0.33) mm. wide; chela exclusive of pedicle 1.38 (1.32) mm. long, width exclusive of hook 0.525 (0.51) mm.; chelal hand exclusive of pedicle 0.67 (0.65) mm. long, 0.56 (0.54) mm. deep; movable chelal finger 0.75 (0.77) mm. long. First leg with pars basalis 0.212 (0.178) mm. deep; pars tibialis 0.17 (0.145) mm. deep; entire femur 0.63 (0.57) mm. long; tibia 0.465 (0.44) mm. long, 0.118 (0.106) mm. deep; tarsus 0.45 (0.41) mm. long, 0.076 (0.071) mm. deep. Fourth leg with pars basalis 0.22 (0.194) mm. deep, pars tibialis 0.24 (0.212) mm. deep; femur 0.78 (0.73) mm. long; tibia 0.64 (0.59) mm. long, 0.145 (0.133) mm. deep; tarsus 0.53 (0.48) mm. long, 0.092 (0.09) mm. deep; tactile seta present on tarsus as in the female.

*Genital Complex*.—Between 20 and 25 setae on the posterior operculum with 4 to 6 smaller setae on the very posterior rim of the genital aperture; nearly 30 scattered setae on the anterior operculum.

*DISTRIBUTION*.—This widespread eastern species, originally described from Florida, has been collected from nine localities in Illinois, ranging from the central to the southern part of the state.

Two collections were taken from fungi, one from a rotten log, three from tree holes, three from ground cover and woody debris,

two from mammal nests, and one from the stomach of a red-bellied woodpecker.

**Illinois Records.**—CACHE: debris in hollow tree, April 19, 1944, Ross & Sanderson, 1 ♀. CAHOKIA: "50" on cork, Aug. 6, 1943, W. Snow, 1 ♀ (ws). HAVANA: debris and nest in log, Nov. 9, 1943, Ross & Sanderson, 2 ♀; ground cover below levee near river, Nov. 9, 1943, Ross & Sanderson, 1 ♀. HERRIN: July 24, 1944, W. Snow, 1 ♀ (ws). KAMPSVILLE: leafy and woody debris on hillside, Sept. 30, 1943, Ross & Sanderson, 1 ♂. ONARGA: fungus in tree hole, July 22, 1943, H. H. Ross, 2 ♀. QUINCY: near Burton's Cave, mouse nest and dead wood in hollow snag, April 27, 1944, C. Hoff, 1 ♂ (CH). URBANA: in rotten log, March 29, 1942, H. H. Ross, 1 ♀; tree hole, Nov. 12, 1944, W. Snow, 1 ♀ (ws); University Woods, stomach of red-bellied woodpecker, Nov. 12-13, 1934, A. C. Toumey, 1 ♀ (HJV). WHITE HEATH: "ex-fungi," Aug. 5, 1939, Ross & Riegel, 2 ♀.

## 22. *ILLINICHERNES* new genus

**DIAGNOSIS.**—Chelicera with flagellum of four setae; basal seta of cheliceral hand acuminate, subbasal seta denticulate. Palps fairly stout; setae, figs. 46C-46E, of palps and more especially of dorsum of body bilaterally feathered, leaflike, and stout; setae of sternal scuta chiefly clavate; proximal two-thirds of fixed chelal finger, fig.

46B, bearing long clavate setae; tactile seta of movable chelal finger closer to *t* than to *sb*; *ist* considerably distad from *est* on fixed chelal finger; both *ib* and *isb* distad from the level of *esb*; palps showing little sexual dimorphism. Tarsus of fourth leg without a tactile seta. Seminal receptacle of female not observed.

**Genotype.**—*Illinichernes distinctus* new species.

This genus appears closely related to the genus *Hesperochernes* Chamberlin, from which it may be separated without difficulty by the nature of the setae of the body and palps and the acuminate condition of the basal seta of the cheliceral hand. Only one species is known in the genus.

### *Illinichernes distinctus* new species

This species is the only one known in the genus; hence, the diagnostic features of the genus are also the diagnostic features of the species. Several diagnostic structures are illustrated in fig. 46.

**MALE.**—Description based on three males, including the holotype. Measurements are given as the limits of range. Body stout; palps and legs moderately stout; body and legs light brown; palps deep reddish-brown or golden in color; body 1.7-1.85 mm. long. Carapace with anterior half rounded, lateral margins convex; surface coarsely granular; setae stout, wide, and feather-like in general appearance; no eye spots; median

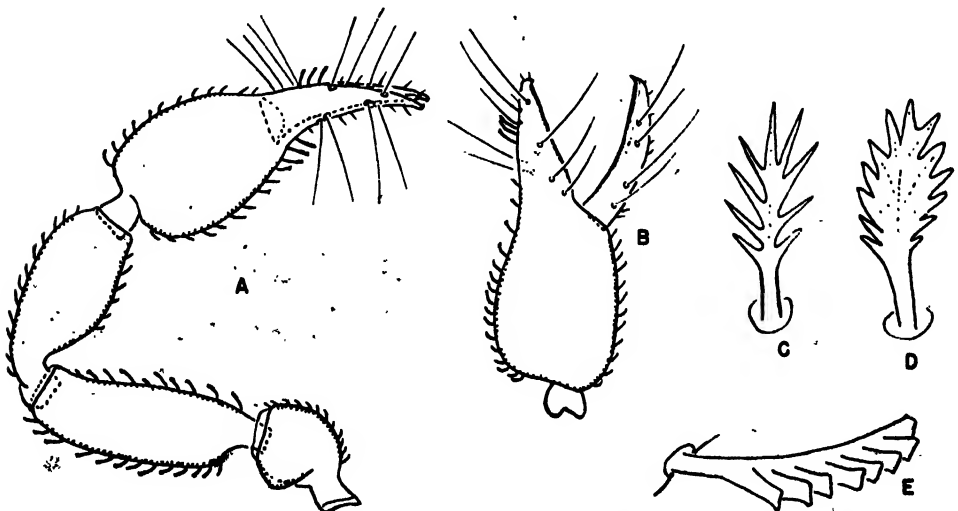


Fig. 46.—*Illinichernes distinctus*, holotype ♂. A, dorsal view of palp; B, lateral view of chela; C, a seta of the palpal femur; D, another seta of the palpal femur; E, side view of a seta from the palpal femur.



transverse furrow a little posteriad to or near the center of the carapace, posterior furrow much nearer to the posterior carapagic margin than to the median furrow; 12 to 14 setae along the posterior margin of the carapace; length of carapace 0.65–0.72 mm., greatest width near the center and equal to 0.62–0.65 mm.; posterior width very slightly less than the greatest width. Abdomen oval, very stout; tergites except the eleventh divided; surface of tergites granular; interscutal spaces not especially wide, usually narrow; each scutum of first tergite with six to eight setae; maximum number of setae on any tergite is about 11; all tergal setae stout and clavate, like those of the carapace. Sternites 4 to 10 divided, interscutal spaces narrow and striate; setae of sternal halves varying from subacuminate on the anterior part of the abdomen to strongly clavate on the central and posterior portions; each fourth sternal scutum with 5 or 6 setae, maximum number on central sternites about 10; surface of sternal scuta with scalelike markings. Each anterior stigmatic plate with two or three small acuminate setae, each posterior plate with three. Pleural membranes very rugose and irregularly striate; length of abdomen 1.05–1.13 mm., width about 0.95–1.02 mm.

*Chelicera*.—Yellow in color; fairly stout; exterior surface of base marked by weakly developed netlike lines; subbasal seta with three or four terminal and subterminal spinules; basal seta smaller and acuminate; largest flagellar seta unilaterally serrate along the distal half; the two smaller flagellar setae subequal in length; chelicera about 0.19 mm. long and with the base 0.12 mm. wide; length of movable finger between 0.145 and 0.165 mm. Fixed finger slender; three small rounded teeth on the inner surface of the apical tooth followed by four (of which the basal two are weak) denticles along the inner finger margin. Movable finger with a long and slender apical tooth, subapical lobe moderately well developed but much shorter than the apical tooth; galeal seta reaching about to the level of the tip of the galea; galea straight and with two or three very minute denticles (often not discernible) confined to the distal one-third of the galea; serrula exterior consisting of 15 or 16 ligulate plates.

*Palp*.—Fig. 46*A*. Coarsely granular except on the chelal fingers; most setae of maxilla weakly clavate, with numerous den-

ticulations; setae of trochanter, femur, tibia, and chelal hand clavate, stout, very similar to those of the carapace and tergites; fixed finger with long clavate setae on the dorsal and extensor surfaces of more than the basal one-half of the finger, setae of the remainder of the fixed finger and the entire movable finger acuminate. Maxilla 0.33–0.37 mm. long, 0.25–0.26 mm. wide. Trochanter with well-defined pedicle about as long as wide; subspherical in shape beyond the pedicle; sublateral and subdorsal protuberances rounded and not much elevated; thickly set with setae on the flexor surface but very few setae on the extensor surface; trochanter 0.32–0.385 mm. long, about 0.21–0.242 mm. wide, length 1.5 to 1.6 times the width. Femur with a well-defined pedicle about as long as wide; femur subcylindrical beyond the pedicle except near the distal end; extensor margin flatly convex in the central part, a little more convex beyond; flexor margin very weakly convex in the central part and very weakly concave in the distal one-third or one-fourth; 0.6–0.69 mm. long, 0.21–0.225 mm. wide, length 2.85 to 3.05 times the width. Tibia pedicellate; extensor margin flatly convex in the central part but a little more convex near each end; flexor margin centrally rounded and somewhat bulging, flattened or very little concave in the distal part; tibia 0.57–0.63 mm. long, 0.225–0.25 mm. wide, length 2.5 to 2.55 times the width. Chela with both extensor and flexor margins of hand gently and evenly rounded; pedicle placed slightly toward the extensor margin; fingers relatively stout, slightly curved, and tapering gradually toward the distal end; chela exclusive of pedicle 0.84–0.955 mm. long, 0.34–0.365 mm. wide, length 2.45 to 2.6 times the width; chelal hand without pedicle 0.44–0.49 mm. long, 0.32–0.375 mm. deep; length of movable chelal finger 0.42–0.48 mm. From the side, chela, fig. 46*B*, fairly stout; pedicle displaced conspicuously toward the ventral side; ventral margin a little less convex than the dorsal margin; fixed finger stout and straight, tapering regularly toward the distal end; movable finger curved and more slender than the opposing finger. Movable finger with nodus ramosus between one and two areolar diameters basad from the level of tactile seta *st*. Tactile setae placed as shown in the figure. Marginal teeth of chelal fingers contiguous, and, except for a few proximal teeth, cusp-bearing;

usually between 30 and 35 marginal teeth on each finger; movable finger usually with four or five external and one or two internal accessory teeth; fixed finger with seven or eight external and two or three internal accessory teeth. Vestigial venedens and short venom duct on fixed finger.

*Legs.*—Moderately slender; most segments except the tarsi sculptured by scale-like to granular markings; all setae except a few on the distal portion of the tarsi multidenticulate and clavate to subclavate. First leg with pars basalis 0.13–0.14 mm. deep; pars tibialis slender, extensor margin a little convex, flexor margin less convex to almost straight, 0.11–0.12 mm. deep; entire femur 0.42–0.47 mm. long, length 3.2 to 3.35 times the depth; tibia with flexor margin a little convex, extensor margin very weakly concave in the distal two-thirds, 0.32–0.35 mm. long, 0.08–0.086 mm. deep, length 3.95 to 4.1 times the depth; tarsus with the extensor margin almost straight, flexor margin a little convex, tapering somewhat toward the distal end, 0.34–0.38 mm. long, 0.058–0.064 mm. deep, length 5.85 to 6.4 times the depth. Fourth leg with the pars basalis 0.135–0.148 mm. deep; pars tibialis 0.145–0.159 mm. deep; entire femur fairly slender, extensor margin evenly convex, flexor margin nearly straight, 0.51–0.595 mm. long, length 3.45 to 3.8 times the depth; tibia weakly S-shaped, 0.43–0.48 mm. long, 0.09–0.1 mm. deep, length 4.6 to 4.9 times the depth; tarsus with both margins slightly convex, tapering in the distal one-half, 0.37–0.4 mm. long, 0.07–0.072 mm. deep, length 5.3 to 5.6 times the depth.

*Genital Complex.*—Anterior operculum with usually between 35 and 40 acuminate and well-developed setae; posterior operculum with four to six multidenticulate setae along the posterior margin, with a total of about 20 setae on the operculum.

*FEMALE.*—Measurements and ratios given are the ranges of three females, the allotype and two paratypes. Essentially like the male; body 1.95–2.05 mm. in length. Carapace with 14 to 16 marginal setae, 0.72–0.79 mm. long, greatest width 0.61–0.69 mm., posterior width little less than the greatest width. Abdomen 1.15–1.3 mm. long, 1.05–1.2 mm. wide.

*Chelicera.*—Chiefly as in the male except the galea with five terminal and subterminal rami, each minute and simple, but much more highly developed and conspicuous than

in the male; galeal seta not extending to the tip of the galea; serrula exterior of 16 to 17 plates; chelicera 0.21–0.22 mm. long, base 0.112–0.117 mm. wide, movable finger 0.15–0.155 mm. long.

*Palp.*—Virtually like that of the male. Maxilla 0.35–0.38 mm. long, 0.24–0.26 mm. wide, length 1.43 to 1.48 times the width; trochanter 0.36–0.39 mm. long, 0.22–0.24 mm. wide, length 1.58 to 1.6 times the width; femur measured along the extensor margin 0.64–0.73 mm. long, 0.21–0.225 mm. wide, length 2.97 to 3.22 times the width; tibia 0.58–0.66 mm. long, 0.225–0.25 mm. wide, length 2.43 to 2.64 times the width; chela exclusive of pedicle 0.88–0.975 mm. long, 0.325–0.37 mm. wide, length 2.55 to 2.7 times the width; hand of chela without pedicle 0.45–0.5 mm. long, 0.325–0.37 mm. deep; movable chelal finger 0.45–0.51 mm. in length. Tactile setae and teeth of chelal fingers as in the male.

*Legs.*—As in the male. First leg with pars basalis 0.133–0.143 mm. deep; pars tibialis 0.11–0.12 mm. deep; entire femur 0.44–0.51 mm. long, length 3.22 to 3.6 times the depth; tibia 0.34–0.38 mm. long, 0.085–0.09 mm. deep, length 3.92 to 4.22 times the depth; tarsus 0.35–0.38 mm. long, 0.065–0.07 mm. deep, length 5.0 to 5.6 times the depth. Fourth leg with pars basalis 0.137–0.152 mm. deep; pars tibialis 0.145–0.158 mm. deep; entire femur 0.56–0.64 mm. long, 3.65 to 4.05 times the depth; tibia 0.45–0.51 mm. long, 0.092–0.103 mm. deep, length 4.65 to 4.95 times the depth; tibia 0.39–0.42 mm. long, 0.069–0.076 mm. deep, length 5.3 to 5.8 times the depth.

*Genital Complex.*—Anterior operculum with 30 to 35 scattered setae; posterior operculum with 13 to 15 setae arranged in a single marginal row along the posterior margin of the operculum.

*TRITONYMPH.*—Observations and measurements based on three individuals. Body and appendages with color, sculpturing, and chaetotaxy much as in the adult; body 1.25–1.45 mm. long. Carapace usually with 10 to 12 setae along the posterior carapacic margin; carapace about 0.6 mm. long, 0.52 mm. wide. Tergites less sclerotic than in the adult; each first tergal scutum with five or six setae, central scuta with no more than eight setae. Sternites faintly sculptured, without color, weakly sclerotized; setae as in the adult, four or five setae on each fourth half-sternite, central sternal halves

with no more than six setae. Each stigmatic plate with two setae; abdomen 0.69–0.84 mm. long, 0.72–0.77 mm. wide.

**Chelicera.**—Like that of the female in all details including the nature of the galea, but smaller and less sclerotic. Chelicera 0.175–0.19 mm. long, base about 0.1 mm. wide; movable finger 0.13–0.135 mm. long; serrula exterior of 14 ligulate plates.

**Palp.**—Essentially like that of the male except the segments are smaller; the femur and tibia, especially the pedicles, are relatively stouter while the chela is a little more slender; the palps are a little lighter in color than in the male. Palps with maxilla 0.27–0.29 mm. long, 0.185–0.2 mm. wide, length about 1.45 times the width; trochanter about 0.285 mm. long, 0.17–0.18 mm. wide; femur measured along the extensor margin 0.45–0.47 mm. long, 0.16–0.17 mm. wide, length 2.75 to 2.85 times the width; tibia 0.42–0.45 mm. long, 0.175–0.185 mm. wide, length 2.4 to 2.45 times the width; chela exclusive of pedicle 0.66–0.68 mm. long, 0.245–0.25 mm. wide, length between 2.65 and 2.8 times the width; chelal hand without pedicle 0.33–0.34 mm. long, 0.24 mm. deep; movable finger 0.34–0.35 mm. long. From the side, the chelal hand appears less stout than that in the adult. Movable finger with three tactile setae: *t* about one-third of the finger length from the tip; *st* in the basal half of the finger and very little closer to *t* than to *sb*; *sb* between one-fourth and one-fifth of the finger length from the hand margin; *b* wanting; nodus ramosus about midway between *t* and *st*. Fixed finger with tactile setae much as in the adult except seta *ist* is wanting. About 25 or 30 marginal teeth on each finger; somewhat fewer accessory teeth than in the adult.

**Legs.**—Lighter in color, somewhat less sclerotic, smaller, and a little stouter than in the adult; surface of segments virtually without sculpturing; setae as in the adult. First leg with segments shaped much as in the adult except that the tibia and the tarsus are much stouter and the tarsus narrows more rapidly toward the distal end; entire femur 0.33–0.35 mm. long, length 3.1 to 3.2 times the depth; tibia 0.24 mm. long, 0.072–0.076 mm. deep, length 3.15 to 3.35 times the depth; tarsus 0.26–0.28 mm. long, 0.06–0.061 mm. deep, length 4.35 to 4.7 times the depth. Fourth leg much like that of the male; the flexor margin of the tibia evenly but weakly convex, the extensor mar-

gin virtually straight to a little concave in the distal two-thirds; the tarsus tapering markedly in the distal one-half; pars tibialis 0.114–0.122 mm. deep; entire femur 0.41–0.42 mm. long, length 3.45 to 3.6 times the depth; tibia 0.32–0.33 mm. long, 0.08–0.085 mm. deep, length 3.8 to 4.15 times the depth; tarsus 0.29–0.31 mm. long, 0.064–0.065 mm. deep, length 4.55 to 4.8 times the depth.

**PROTONYMPH.**—Description based on two individuals; measurements of one are given in parentheses after the measurements of the other whenever the two differ. Body stout; lighter in color than the adult; length 1.02 (0.94) mm. Setae of body, legs, and palps like those of the adult except much less numerous. Ten or 11 plates on the serrula exterior of the movable chelicer al finger. Palps much lighter in color than in the adult; surface of trochanter and femur granular, surfaces of tibia and chela slightly granulate or smooth; clavate setae on the side of the fixed chelal finger as in the adult. Palpal segments smaller and, with the exception of the chela, much stouter than in the tritonymph. Palpal femur 0.2 (0.21) mm. long, 0.095 mm. wide; tibia 0.2 mm. long, 0.105 (0.1) mm. wide; chela 0.39 (0.40) mm. long exclusive of pedicle, about 0.135 mm. wide; chela 0.135 mm. deep; hand exclusive of pedicle 0.2 (0.19) mm. long; movable finger 0.205 mm. long. Each chelal finger with between 15 and 20 marginal teeth, chiefly acuspid; no accessory teeth observed. Movable finger with one tactile seta (*t*?) near the center of the finger. Three setae on the fixed finger; two are external, one about one-third of the finger length from the tip and the other near the base; one is internal, located between one-third of the finger length from the base and the mid-point of the finger.

**Holotype, male.**—Magnolia, Illinois: decayed log, March 23, 1944, H. H. Ross.

**Allotype, female.**—Same data as for holotype.

**Paratype.**—ILLINOIS.—KELL: March 7, 1945, Ross & Sanderson, 2 ♂, 2 protonymphs, 1 tritonymph. MAGNOLIA: same data as for holotype, 2 ♀, 3 tritonymphs, 1 ♀ (CH).

No habitat data accompany the Kell collection.

### 23. *Genus? corticis* Ewing

*Chelanops corticis* Ewing (1911, p. 75).

In spite of the large number of collections available, I have been unable to associate

any of the Illinois specimens with *Chelanops corticis* described by Ewing. Since Ewing's description does not include generic key characters in use at present, and since it has been impossible to locate the types of this species, I am unable to assign *corticis* even tentatively to a genus. According to correspondence from J. C. Chamberlin, the species should serve as the genotype of a new genus. However, since no specimens are available for study, I hesitate to establish a new genus with *corticis* as the genotype.

From Ewing's description, it is apparent that the species belongs in the family Chernetidae and the subfamily Chernetinae.

On the basis of Ewing's description, it is possible to devise means of separating *corticis* from other species of the subfamily Chernetinae found in Illinois. Among the important characteristics listed for *corticis* in the original description and not found in other Illinois species are the following:

1. Galea very long, about two-thirds as long as the movable cheliceral finger.

2. The flexor margin of the palpal femur is bulging just distad from the pedicle; then is virtually straight for at least two-thirds of the length of the femur.

3. The flexor margin of the palpal tibia is markedly bulging in the basal half; then is virtually straight beyond; while the other margin beyond the pedicle is more or less evenly rounded.

4. The palpal hand is suboval in general shape and the palpal fingers are much stouter than in most species of Chernetinae.

5. The hairs of the fingers arise from minute tubercles.

**Illinois Records.**—In the original description two collections are cited, both from Illinois, as follows: HAVANA: from under bark of trees standing in water, Aug. 9, 1908, H. E. Ewing, 2 specimens; URBANA: March, 1902, J. W. Folsom, 2 specimens.

## UNIDENTIFIED NYMPHS

Among the many collections examined, a few contained chernetid nymphs unassociated with adults or nymphs that are obviously of different species from the adults in the same collection. In these instances where certain association cannot be made between the immature and adult animals, it seems advisable to refrain both from describing the nymphs and from giving tentative identifications. Collections containing undeter-

mined nymphs are from Champaign, Mason, Iroquois, Vermilion, St. Clair, Alexander, Will, Jackson, Calhoun, Lake, Madison, and Kane counties.

## ATEMNIDAE

Members of this family are rare in the Western Hemisphere, being typically Oriental and Ethiopian in distribution. One species, *Paratemnus elongatus* (Banks), is known from Florida.

## CHELIFERIDAE

Pseudoscorpions belonging in this family may be recognized by the absence of accessory teeth from the chelal fingers and by the presence of a venom apparatus and tooth on each of the chelal fingers, fig. 51C. The world fauna of the family is divided into three subfamilies. One of these, fig. 47, the Cheliferinae, is present in the central and eastern part of the United States. Another subfamily, the Withiinae, is represented in the fauna of America north of Mexico only by a few species, restricted as far as known to Texas and California.

### KEY TO SUBFAMILIES

- Flagellum with four or five setae; usually some abdominal sternites of the males with clusters of microsetae; coxae of male without coxal sacs; well-developed genital sacs lacking....  
 .....Withiinae  
 Flagellum with three setae; male without clusters of microsetae on abdominal sternites; coxal sac present in the fourth coxa; well-developed genital sacs usually present, fig. 10.....Cheliferinae

### Subfamily WITHIINAE

The subfamily is represented in the United States by only one genus, which has been reported from the southern part of the United States and from the West Coast region.

### Subfamily CHELIFERINAE

The subfamily is characterized above in the key. Two tribes are described in the subfamily, both represented in Illinois.

### KEY TO GENERA

1. Dorsal plates of the entire posterior half of the abdomen bearing a seta in the center of each of the sclerotized halves,

- fig. 51B, in addition to the peripheral setae.....2  
Dorsal plates of the posterior portion of the abdomen having only peripheral setae on each of the sclerotized halves,

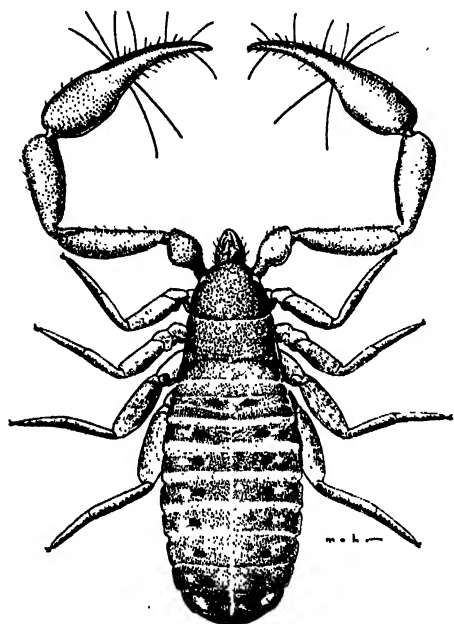


Fig. 47.—*Dactylochelififer copiosus*. An example of the suborder Monosphyronida and the family Cheliferidae.

- except occasionally on last one or two segments, fig. 50B.....3  
2. Tarsal claws of at least legs II and III distally split or having a small to medium subterminal inner tooth, as in fig. 50D, but larger; plumose setae of the carapace arising from greatly enlarged tubercles or warts; statumen convolutum of the male genitalia invaginated anteriorly, containing a median sclerotized rod within the invagination; fourth coxal male genital sac without a differentiated median atrium.....**24. Chelififer**  
Tarsal claws of all of the legs without lateral or inner teeth; plumose setae of the carapace not arising from conspicuously enlarged warts; statumen convolutum of the male genitalia rounded anteriorly, not cleft, and without a median sclerotized rod, fig. 10; fourth coxal male genital sac having a well-marked atrium medially, fig. 10.....**27. Dactylochelififer**  
3. Tibia and tarsus of leg IV subequal in length; coxae without spurs.....**26. Palsochelififer**

- Tibia  $1\frac{1}{4}$  times as long as the tarsus of leg IV; coxae IV of males with spurs near the anterolateral corner.....**25. Idiochelififer**

### Tribe CHELIFERINI

In this tribe the male has coxal sacs that lack well-differentiated atria and the statumen convolutum of the genital complex is invaginated anteriorly to form a median depression in which lies a sclerotic rod. The female, almost without exception, has the median cribriform plates paired and separate, not fused together.

About a dozen genera have been placed in this tribe of which eight are known from the nearctic and neotropical regions and three from Illinois. A key to all the genera in the tribe is given by Hoff (1946d).

#### 24. *CHELIFER* Geoffroy

*Chelififer* Geoffroy (1762, p. 617). Genotype, by subsequent designation of Simon (1879): *Acarus cancroides* Linnaeus.  
*Chelififer* Geoffroy. Chamberlin (1932, p. 19), Beier (1932c, p. 235).

DIAGNOSIS.—Cephalothorax and palps granular; cephalothorax with numerous large granules scattered among the others; eyes present; tergites divided, anterior tergites of the male with lateral keels. Flagellum with subbasal seta of the base absent. Palp slender. Tarsus of the first pair of legs in the male without terminal spine; subterminal setae of fourth pedal tarsus denticulate; tarsal claws bifid except for modified claws of first leg of male.

A single species occurs in North America.

#### *Chelififer cancroides* (Linnaeus)

*Acarus cancroides* Linnaeus (1758, p. 616).  
*Chelififer cancroides* Fourcroy (1785, p. 526).  
*Chelififer muricatus* Say, in part (1821, p. 63).  
*Chelififer cancroides dentatus* Ewing (1911, p. 73).  
*Chelififer cancroides* (Linnaeus). Beier (1932c, p. 236), Hoff (1944a, p. 123).

Inasmuch as *cancroides* is the only known Illinois species of the genus *Chelififer*, it can be identified on the basis of the generic characteristics, figs. 9, 48. Measurements of several Illinois individuals are given below to show the variation that occurs in the palpal segments.

Through the kindness of Henry Dietrich of the Cornell University Museum, I have examined six males of the type collection of

*Chelifer cancroides dentatus* Ewing from Otto, New York. All of these were found to be typical *cancroides*.

Several nymphs, apparently of this species, were found in some of the collections. These nymphs differ markedly from the adults by having entire and not toothed tarsal claws on the legs. A description of the nymphal stages is postponed until a larger number of specimens can be secured for study.

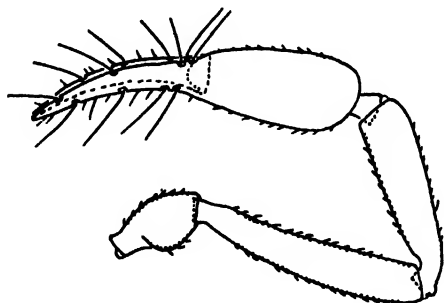


Fig. 48.—*Chelifer cancroides* ♀. Dorsal view of palp.

**MALE.**—Measurements and ratios are the ranges secured by measuring four males. Body length 2.55–3.2 mm.; palpal femur 1.16–1.29 mm. long, 0.21–0.25 mm. wide, length 5.2 to 5.55 times the width; tibia 0.95–1.15 mm. long, 0.24–0.275 mm. wide, length 3.85 to 4.1 times the width; chela exclusive of pedicle 1.6–1.85 mm. long, 0.4–0.475 mm. wide, length 3.9 to 4.1 times the depth; chelal hand exclusive of pedicle 0.75–0.9 mm. long, 0.36–0.45 mm. deep; movable chelal finger 0.85–1.05 mm. long.

**FEMALE.**—Measurements and ratios are given as the range of four females. Body length 3.3–3.7 mm.; palpal femur 1.15–1.2 mm. long, 0.21–0.25 mm. wide; length of femur 4.75–5.45 times the width; palpal tibia 0.95–1.05 mm. long, 0.24–0.28 mm. wide, length 3.75 to 4.1 times the width; chela exclusive of pedicle 1.55–1.8 mm. long, 0.37–0.46 mm. wide, length 3.95 to 4.25 times the width; hand exclusive of pedicle 0.75–0.85 mm. long, 0.35–0.45 mm. deep; movable finger 0.85–1.0 mm. long.

**DISTRIBUTION.**—This cosmopolitan species is invariably associated with man and may be found in dwellings, barns, granaries, beehives, and the nests of such birds as sparrows and starlings (Hoff 1944a). One collection in the present lot was taken from cattle. Although the species is thought to

molest man only infrequently, one collection was labeled "Attacking People."

The species is much more common than the number of collections reported here would indicate because most of the collections used in this study were taken from natural habitats. Most of the pseudoscorpions brought to schools and museums for identification are of this species; people ordinarily do not encounter the species that occur in soil, under the bark of trees, and in other natural habitats.

Ewing (1911) recorded *cancroides* and its varieties from several localities in Illinois. Several of these records apply to other species, but the record of one specimen from a house in Arcola is probably true *cancroides*.

**Illinois Records.**—Many specimens of both sexes have been collected from Arcola, Champaign, Chicago, Deerfield, Freeburg, Glencoe, Palos Park, Quincy, Roodhouse, Shumway, Springfield, Urbana, Waukegan.

## 25. *IDIOCHELIFER* Chamberlin

*Idiochelifer* Chamberlin (1932, p. 19). Genotype, by original designation: *Chelifer cancroides* var. *nigripalpus* Ewing.

*Idiochelifer* Chamberlin. Hoff (1946d, p. 486).

**DIAGNOSIS.**—Cephalothorax a little longer than wide, with a few large, seta-bearing tubercles scattered among the investing granules; cephalothorax with two cross furrows; eyes present. Tergites divided, those of the male with crests or keels. Each coxa of the fourth leg of the male with a coxal sac and lateral spur; subterminal setae of the tarsus of the fourth leg *toothed*, not *simple*; tarsus of the first leg of the male without a terminal spine; claws of pedal tarsi simple except one claw of first leg of male with a well-developed accessory tooth; tarsus of the fourth leg with a tactile seta distad from the mid-point. Cribiform plates of female genitalia moderately small.

Among several females observed as belonging to the species *nigripalpus*, there was found one in which many of the tarsal claws of the legs have an accessory tooth. This is clearly an anomaly and does not necessitate a modification of the generic diagnosis.

The only species known in the genus occurs in Illinois.

### *Idiochelifer nigripalpus* (Ewing)

*Chelifer muricatus* Say, in part? (1821, p. 63).

*Chelifer cancroides* var. *nigripalpus* Ewing (1911, p. 73).

*Chelifer nigripalpus* Ewing, Chamberlin (1931a, p. 52).

*Idiochelifer nigripalpus* (Ewing), Chamberlin (1932, p. 19), Hoff (1946c, p. 26).

*Hysterochelifer longidactylus* Hoff (1945b, p. 511).

It is probable that Say (1821) included specimens of *Idiochelifer nigripalpus* in his collection of *Chelifer muricatus*. Since types are not intact and since Say apparently based his description on several species, including *Chelifer cancroides* as indicated by the

here. Diagnostic parts are illustrated in figs. 49A-49C.

**MALE.**—Important measurements are given as the range of three males from Illinois. Body length 2.1–2.35 mm.; carapace 0.8 mm. long, ocular width 0.39–0.4 mm. Palpal femur 0.78–0.84 mm. long, 0.18–0.185 mm. wide, length 4.35 to 4.55 times the width; tibia 0.64–0.71 mm. long, 0.21 mm. wide; chela without pedicle 1.36–1.41 mm. long, 0.31–0.32 mm. wide, length 4.3 to 4.4 times the width; chelal hand exclusive of pedicle 0.63–0.65 mm. long, movable chelal finger 0.76–0.80 mm. long.

**FEMALE.**—Measurements of the palpal segments and body length are the ranges of four mounted females; other measurements are given as the ranges of three mounted individuals. Body length (abdomen somewhat contracted in some specimens) 2.1–2.55 mm.; carapace 0.82–0.86 mm. long, 0.8–0.86 mm. wide across the posterior margin; ocular width 0.4–0.44 mm. Chelicera about 0.24 mm. long, base 0.14–0.15 mm. wide; movable finger, fig. 49B, 0.18–0.195 mm. long. Palp, fig. 49A, with maxilla 0.4–0.45 mm. long, 0.26–0.29 mm. wide; trochanter about 0.43 mm. long, 0.24–0.25 mm. wide; femur 0.82–0.87 mm. long, 0.19–0.195 mm. wide, length 4.3 to 4.6 times the width; tibia 0.65–0.71 mm. long, 0.22–0.23 mm. wide, length 2.95 to 3.2 times the width; chela exclusive of pedicle 1.37–1.43 mm. long, 0.34–0.35 mm. wide, length 3.95 to 4.1 times the width; chelal hand exclusive of pedicle 0.65–0.68 mm. long, about 0.31 mm. deep; movable finger 0.75–0.79 mm. long. First leg with pars basalis 0.148–0.163 mm. deep, pars tibialis 0.137–0.14 mm. deep; entire femur about 0.5 mm. long; tibia 0.33–0.35 mm. long, 0.095–0.1 mm. deep; tarsus 0.35–0.37 mm. long, 0.072–0.076 mm. deep. Fourth leg with pars basalis 0.167–0.18 mm. deep, pars tibialis 0.243–0.265 mm. deep; entire femur about 0.7 mm. long; tibia 0.51–0.53 mm. long, 0.132–0.145 mm. deep; tarsus 0.4–0.415 mm. long, about 0.095 mm. deep; tactile seta located 0.28–0.30 mm. from the proximal margin of the tarsus.

**DISTRIBUTION.**—This species is known from several north-central states, including Illinois, Iowa, and Wisconsin. Undoubtedly several of Ewing's (1911) records of *cancroides* apply to this species. In the Museum of Comparative Zoology is a mounted female from Arcola (Douglas County), Illinois, that is labeled *Chelifer cancroides* and

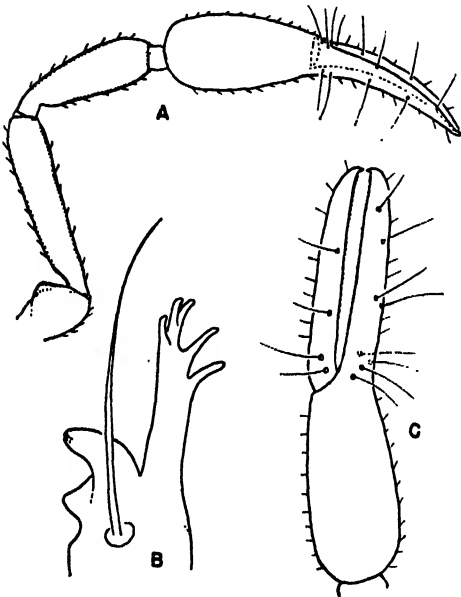


Fig. 49.—*Idiochelifer nigripalpus* ♀. A, dorsal view of palp; B, end of movable chelical finger; C, lateral view of chela.

record from a house, *Chelifer muricatus* must for all practical purposes be considered a *nomen nudum*.

In the original description of this species, no type specimens were indicated. Several specimens in the Cornell University collection are undoubtedly the types of the species, and one of these, from Ames, Iowa, was designated recently as the lectotype (Hoff 1946c).

Since the type specimens of this species have been described in some detail (Hoff 1946c) and the females have been described (Hoff 1945b) under the name *Hysterochelifer longidactylus* Hoff, only selected measurements of Illinois specimens are given

that apparently was reported under this designation by Ewing. A mounted male of this species from Clark County, Illinois, in the Ewing collection at Cornell is labeled *Chelifer cancroides* and apparently was not included among the records given by Ewing for Illinois. These and other records indicate a scattered distribution for the species over the central and northern parts of Illinois.

Seven of the Illinois collections of this species were made from the bark of living trees, chiefly oaks and hickories; the eighth collection lacks ecological data.

**Illinois Records.**—ALPHA: April 19, 1946, C. Hoff, 1 ♂, 1 ♀; April 20, 1946, C. Hoff, 2 specimens (CH). ARCOLA: July 21, 1909, H. E. Ewing, 1 ♀ (MCZ). FOX LAKE: June 11, 1947, Burks & Stannard, 2 specimens. HOMER: July 3, 1944, H. H. Ross, 1 ♀. MAHOMET: July 10, 1943, Ross & Beaver, 1 ♀, 1 tritonymph. MARSHALL: Oct. 31, 1908, J. L. Pricer, 1 ♂ (CU). ROCKFORD: Nov. 29, 1944, C. L. Remington, 1 ♀ (CR). STARVED ROCK STATE PARK: July 12, 1944, Frison & Sanderson, 1 ♀.

## 26. PAISOCHELIFER Hoff

*Paisochelifer* Hoff (1946d, p. 487). Genotype by original designation: *Hysterochelifer callus* Hoff.

**DIAGNOSIS.**—Carapace wider than long, uniformly granular; transverse furrows deeply impressed, the posterior furrow about one-half as far from the posterior carapacic

margin as from the median furrow; one pair of eyes. Tergites, including the eleventh, divided; lateral keels of the male wanting or very weakly developed. Flagellar setae of chelicera entire. Movable chelal finger with *st* nearer *sb* than to *t* and fixed finger with *est* and *ist* on nearly the same level and considerably proximad from the mid-point of the finger. Coxa of the fourth leg of the male with coxal sac; spurs of coxa IV lacking. Subterminal setae of the fourth tarsus weakly toothed. Tarsus of the first leg of the male without a terminal spine. Claws of pedal tarsi, except those of the first leg of the male, simple. A tactile seta located distad from the mid-point of the fourth pedal tarsus.

The genotype, the only species known in the genus, occurs in Illinois.

### *Paisochelifer callus* (Hoff)

*Hysterochelifer callus* Hoff (1945b, p. 515).

*Paisochelifer callus* (Hoff). Hoff (1946d, p. 487).

The adults of this species have been described in detail in the original description (Hoff 1945b). Included here are additional data relative to the measurements of the body and palp, and illustrations of important structures, figs. 50A–50E. The deutonymph, previously unknown, is described in more detail.

**MALE.**—Measurements given as the range of three individuals, including the holotype. Body length 1.68–1.95 mm.; carapace 0.58–

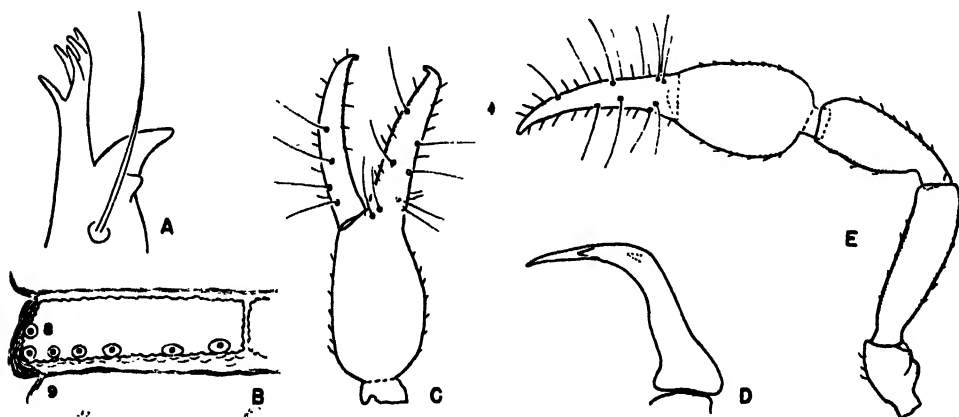


Fig. 50.—*Paisochelifer callus*. A, end of movable cheliceral finger, ♂ (many individuals, including the holotype, have two or three terminal and subterminal denticles on the apical tooth); B, setal map of left half of eighth abdominal tergite, holotype ♂; C, lateral view of chela, holotype ♂; D, lateral view of terminal claw of first leg, holotype ♂; E, dorsal view of palp, allotype ♀.



0.61 mm. long, greatest width 0.61–0.75 mm., ocular breadth 0.32–0.36 mm. Palp with trochanter 0.27–0.28 mm. long, 0.165–0.175 mm. wide, length 1.57 to 1.7 times the width; femur 0.52–0.56 mm. long, 0.155–0.165 mm. wide, length 3.35 to 3.5 times the width; tibia 0.47–0.5 mm. long, 0.18–0.197 mm. wide, length 2.5 to 2.65 times the width; chela exclusive of pedicle 0.89–0.945 mm. long, 0.27–0.295 mm. wide, length 3.2 to 3.45 times the width; chelal hand 0.41–0.46 mm. long exclusive of pedicle, 0.23–0.28 mm. deep; movable chelal finger 0.5–0.53 mm. long. Serrula exterior of the movable chelal finger with 17 or 18 plates.

**FEMALE.**—Measurements given as the range of five females, including the allotype and two paratypes. Body length 1.55–2.15 mm.; carapace 0.63–0.69 mm. long, width usually a little greater than the length but less than the length in one individual; ocular width 0.35–0.38 mm. Palp including trochanter 0.26–0.3 mm. long, 0.16–0.18 mm. wide, length 1.55 to 1.66 times the width; femur 0.59–0.61 mm. long, 0.165–0.175 mm. wide, length 3.45 to 3.65 times the width; tibia 0.48–0.54 mm. long, 0.19–0.205 mm. wide, length 2.4 to 2.7 times the width; chela of palp exclusive of pedicle 1.0–1.07 mm. long, 0.285–0.315 mm. wide, length 3.2 to 3.5 times width; chelal hand exclusive of pedicle 0.48–0.51 mm. long, 0.26–0.295 mm. deep; movable finger 0.53–0.59 mm. long.

**DEUTONYMPH.**—Body and legs light yellowish-brown, palps a little darker; body fairly stout, appendages usually stouter than in the adult. Body length 1.3 mm. Carapace shaped much as in the adult; furrows less well impressed than in the adult; six setae along the posterior carapacic margin; length of carapace 0.44 mm., posterior and greatest width 0.43 mm.; ocular width 0.25 mm. Tergites divided, marked by netlike sculpturing; nearly all tergal halves with three setae similar in nature to those of the adult. Most sternites weakly divided, with very weak, scalelike markings; usually three setae on each half-sternite. Stigmatic plates and pleural membranes as in adult; abdomen 0.85 mm. long, about 0.52 mm. wide.

**Chelicera.**—In general, similar to the chelicera of the adult except lighter in color and smaller; subbasal seta of palm of hand wanting; galea with four simple rami; serrula exterior with 14 plates; chelicera 0.155 mm. long; base 0.085 mm. wide; movable finger about 0.1 mm. long.

**Palp.**—Moderately granular except the chelal fingers, investing setae much as in the adult; segments, with the possible exception of the chela, conspicuously stouter than in the adult. Trochanter about 0.18 mm. long, 0.12 mm. wide. Femur subcylindrical, widened gradually toward the distal end, pedicle almost wanting; both flexor and extensor margins nearly straight; 0.312 mm. long, 0.11 mm. wide. Tibia with weakly developed pedicle much wider than long; flexor margin very weakly convex; extensor margin flatly convex; 0.285 mm. long, 0.133 mm. wide. Chela as viewed from the dorsum with both margins of hand moderately convex, the flexor more so than the extensor; hand gradually narrowed toward the finger base; fingers evenly and gently curved; chela exclusive of pedicle 0.61 mm. long, 0.185 mm. wide; chelal hand exclusive of pedicle 0.29 mm. long, 0.167 mm. deep; movable finger 0.33 mm. long. Viewed from the side, chelal hand appears subcylindrical, ventral margin nearly straight, dorsal margin a little convex; fixed finger nearly straight, movable finger slightly curved. Marginal teeth of the chelal fingers much like those of the adult except the teeth of the basal one-half of the row of the movable finger are acuspid; about 25 teeth on each finger. Movable finger with two tactile setae: one (probably *1*) located a little proximad from the mid-point of the finger; the second (probably *2b*) located twice as far from the first as from the proximal margin of the finger; nodus ramosus located a little distad from the mid-point of the finger. Fixed finger with six setae: *et* a little less than one-third of the finger length from the tip; *it* a little closer to *et* than the latter is to the finger tip; *est* removed from *et* by about the distance of *et* from the finger tip; both *it* and *est* proximad from the mid-point of the finger; one exterior and two interior basal and subbasal setae placed much as in the adult; probably missing setae are *ist* and *esb*; nodus ramosus located less than two areolar diameters basad from tactile seta *et*.

**Legs.**—General characteristics as in the adult but much lighter in color, less sclerotic, and segments smaller and stouter. All tarsal claws simple. First leg with pars basalis 0.08 mm. deep; entire femur 0.209 mm. long; tibia very stout throughout, 0.133 mm. long, 0.06 mm. deep; tarsus subfusiform, narrowing in the distal half, 0.173 mm. long, 0.05 mm. deep. Fourth leg with the pars tibialis

0.103 mm. deep; entire femur 0.285 mm. long; tibia 0.194 mm. long, 0.071 mm. deep; tarsus 0.209 mm. long, 0.057 mm. deep; the tarsus subfusiform, becoming much narrowed in the distal one-half and bearing a tactile seta that is located 0.145 mm. from the proximal margin of the segment.

**DISTRIBUTION.**—This species is known only from Illinois. It was described originally from Zion, and since then another collection has been taken in the same locality.

**DIAGNOSIS.**—Carapace longer than wide, moderately and regularly granular, with two cross furrows. Eyes present. Tergites divided, those of the male without lateral keels or with very weakly developed keels. Setae of body and palp short, toothed, or weakly clavate. Palps moderately slender, with uniformly granular surface; tactile seta *it* about in the middle between *et* and *ist* or somewhat nearer to *et*, fig. 51C. Anterior tarsus of the male always strongly modified, the

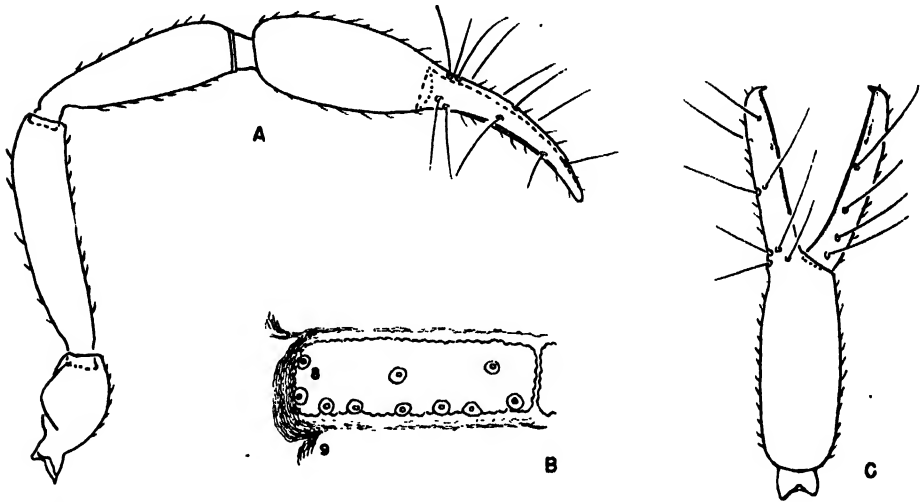


Fig. 51.—*Dactylochelifer copiosus* ♀. A, dorsal view of palp; B, setal map of left half of eighth abdominal tergite; C, lateral view of chela.

The type series was collected on March 17, 1933, from sand and grass roots in dunes area, Frison & Mohr, 1 ♂, 3 ♀; the later collection was made on October 15, 1942, from ground cover, Ross & Sanderson, 2 ♂, 2 ♀, 1 deutonymph.

### Tribe DACTYLOCHELIFERINI

In this tribe, the males usually have a well-differentiated atrium in each coxal sac of leg IV and the sclerotic rod and anterior invagination of the statumen convolutum are always absent from the genital complex, fig. 10. The female has the medial pair of cribriform plates fused into one medial plate. Only one certain genus and one species are found in North America.

#### 27. *DACTYLOCHELIFER* Beier

*Dactylochelifer* Beier (1932a, p. 64; 1932c, p. 253). Genotype, by original designation: *Chelifer latreillei* Leach.

claws asymmetrical; tarsal claws of other legs simple; subterminal setae of the tarsi simple; tarsus of leg IV without a tactile seta.

Only one species, *copiosus*, is known from the nearctic region, and this has been taken in Illinois. Other species of the genus occur throughout the palearctic region.

#### *Dactylochelifer copiosus* Hoff

*Dactylochelifer copiosus* Hoff (1945a, p. 53; 1945b, p. 521).

Adults of this species have been described in detail in the original description (Hoff 1945a). Additional data relative to the limits of range in size of the palpal segments and illustrations of important structures, figs. 10, 47, 51A–51C, are given here. In addition, brief descriptions are presented for the heretofore undescribed nymphal stages.

**MALE.**—Measurements given as the limits of range were secured by measuring 11 individuals from Illinois. Body length 2.3–2.6

mm. Palpal femur 0.8–0.91 mm. long, 0.193–0.215 mm. wide, length 3.9 to 4.25 times the width; tibia 0.72–0.82 mm. long, 0.225–0.245 mm. wide, length 3.0 to 3.4 times the width; chela 1.21–1.36 mm. long, 0.3–0.33 mm. wide, length 3.85 to 4.35 times the width; movable chelal finger 0.66–0.72 mm. long.

**FEMALE.**—Measurements given as the limits of range secured from seven individuals from Illinois. Body length 2.4–3.15 mm. Palpal femur 0.82–0.91 mm. long, 0.19–0.22 mm. wide, length 3.9 to 4.6 times the width but usually 3.9 to 4.2 times the width; tibia 0.74–0.85 mm. long, 0.225–0.245 mm. wide, length 3.2 to 3.55 times the width; chela exclusive of pedicle 1.26–1.43 mm. long, 0.33–0.355 mm. wide, length 3.75 to 4.25 times the width; chelal hand exclusive of pedicle 0.61–0.72 mm. long; movable finger between 0.7 and 0.75 mm. in length.

**TRITONYMPH.**—Measurements given as the limits of range of four individuals. In general, in appearance much like the adult except a little lighter in color and the segments of appendages much smaller and often a little stouter. Body 1.8–2.4 mm. long. Chelicera 0.195–0.22 mm. long, movable finger 0.14–0.15 mm. long; 16 or 17 plates in the serrula exterior. Palp with trochanter 0.32–0.35 mm. long, 0.185–0.19 mm. wide, length 1.65 to 1.85 times the width; femur 0.55–0.65 mm. long, 0.15–0.17 mm. wide, length 3.65 to 3.95 times the width; tibia 0.53–0.6 mm. long, 0.17–0.19 mm. wide, length 3.1 to 3.25 times the width; chela 0.9–1.1 mm. long, 0.23–0.26 mm. wide, length 3.9 to 4.3 times the width; chelal hand 0.46–0.56 mm. long, 0.21–0.25 mm. deep; movable finger 0.50–0.54 mm. long. Fixed chelal finger with seven tactile setae, arranged much as in the adult except *ist* wanting and *it* placed a little closer to the level of *est* than to the level of *et*. Movable finger with three setae, either *b* or *sb* wanting. About 40 or 45 marginal teeth on each chelal finger.

**DEUTONYMPH.**—Measurements given as the range of size of five individuals. Appendages and body much like those of the tritonymph except stouter and much smaller. Body length 1.45–1.6 mm. Serrula exterior of 13 or 14 ligulate plates. Palp with trochanter 0.23–0.24 mm. long, 0.125–0.135 mm. wide, length 1.75 to 1.85 times the width; femur 0.38–0.40 mm. long, 0.11–0.12 mm. wide, length 3.25 to 3.45 times the

width; tibia 0.35–0.37 mm. long, 0.13–0.145 mm. wide, length 2.55 to 2.7 times the width; chela 0.68–0.715 mm. long, 0.18–0.195 mm. wide, length 3.6 to 3.85 times the width; chelal hand 0.34–0.39 mm. long, 0.17–0.185 mm. deep; movable finger 0.34–0.37 mm. long. Movable chelal finger with two setae, one near the proximal margin, the other near the mid-point of the finger; homologies uncertain. Fixed finger with three exterior setae, either *eb* or *esb* wanting; three interior setae as in the tritonymph except *it* relatively closer to the level of *est*. Each chelal finger with about 35 marginal teeth.

**PROTONYMPH.**—Measurements based on five individuals. Appendages and body smaller than in the deutonymph. Palpal segments smaller and, with exception of the chela, appreciably stouter than in the deutonymph. Body 1.15–1.3 mm. long. Serrula exterior of chelicera with 12 plates. Palp with trochanter 0.17–0.18 mm. long, 0.1–0.11 mm. wide, length 1.6 to 1.8 times the width; femur 0.28–0.29 mm. long, 0.095–0.1 mm. wide, length 2.85 to 3.05 times the width; tibia 0.25–0.26 mm. long, 0.105–0.12 mm. wide, length 2.15–2.4 times the width; chela 0.55–0.58 mm. long, 0.145–0.16 mm. wide, length 3.55 to 3.8 times the width; chelal hand exclusive of pedicle 0.27–0.3 mm. long, 0.135–0.155 mm. deep; movable finger 0.29 mm. long. Movable chelal finger with one tactile seta located about one-third of the finger length from the proximal margin. Fixed chelal finger with two exterior setae, one located less than one-third of the finger length from the tip and the other placed near the base of the finger; a single seta of the interior series located near the finger base. About 30 teeth on each chelal finger.

**DISTRIBUTION.**—This species is known from only two states, Arkansas, from which it was originally described, and Illinois, from which it was recorded later (Hoff 1945b). Illinois collections are from scattered localities over the state, with collections more abundant in the southern half.

Almost every collection was taken from ground cover and litter, although one was made while sweeping vegetation with a net.

**Illinois Records.**—All stages have been collected from Burksville, Edwardsville, Geff, Giant City State Park, Gillespie, Grand Detour (Castle Rock), Havana, Herod, Logan, Makanda, Murphysboro, New Columbia, Pere Marquette State Park, Vienna.

### UNIDENTIFIED NYMPHS

Several collections contain nymphs of Cheliferidae that I have found impossible or inadvisable to determine as to genus or

species. These undetermined cheliferid nymphs are from the following counties: Adams, Carroll, Hardin, Jackson, Jersey, La Salle, Macoupin, Madison, Mason, Schuyler, and Union.

## LITERATURE CITED

### Belzan, Luigi

1891. *Chernetes* (Pseudoscorpiones). Société entomologique de France annales 60:497-552. 4 pls. Paris.

### Banks, Nathan

1890. A new pseudoscorpion. Can. Ent. 22:152.  
 1891. Notes on North American Chernetidae. Can. Ent. 23:161-6.  
 1893. New Chernetidae from the United States. Can. Ent. 25:64-7.  
 1895. Notes on the Pseudoscorpionida. N. Y. Ent. Soc. Jour. 3:1-13.

### Beier, Max

- 1930a. Neue Höhlen Pseudoscorpione der Gattung *Chthonius*. Eos 6:232-7. 5 figs. Madrid.  
 1930b. Die Pseudoskorpione des Wiener Naturhistorischen Museums. Wiener Naturhistorisches Museum Annalen 44:199-222. 17 figs. Wien.  
 1932a. Zur Kenntnis der Cheliferidae (Pseudoscorpionidea). Zoologischer Anzeiger 100:53-67. Leipzig.  
 1932b. Pseudoscorpionidea. I. Subord. Chthoniinea et Neobisiinea. Tierreich 57:1-258. 271 figs.  
 1932c. Pseudoscorpionidea. II. Subord. Cheliferinea. Tierreich 58:1-294. 300 figs.  
 1932d. Pseudoscorpionidea—Afterscorpione. In Kükenthal Krumbach, Handbuch der Zoologie 3:117-92. 110 figs.  
 1933. Revision der Chernetidae (Pseudoscorp.) Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere 64:509-48. 15 figs. Jena.  
 1941. Pseudoscorpionidea—Afterscorpione. In Kükenthal Krumbach, Handbuch der Zoologie 3:169-85. 19 figs.

### Chamberlin, J. C.

1924. *Hesperochernes lauræ*, a new species of false scorpion from California inhabiting the nest of *Vespa*. Pan-Pacific Ent. 1:89-90. 1 pl.  
 1925. On a collection of pseudoscorpions from the stomach contents of toads. Cal. Univ. Pubs. Ent. 3:327-32. 16 figs.  
 1926. Notes on the status of genera in the chelonethid family Chthoniidae together with a description of a new genus and species from New Zealand. Dansk Naturhistorisk forening i Kjøbenhavn, Videnskabelige Meddelelser 81:333-8. 1 fig.  
 1929a. *Dinocheirus tenoch*, an hitherto undescribed genus and species of false scorpion from Mexico. Pan-Pacific Ent. 5:171-3.  
 1929b. A synoptic classification of the false scorpions or chela-spinners, with a report on a cosmopolitan collection of the same.—Part I. The Heterosphyronida. Ann. Mag. Nat. Hist., Ser. 10, 4:50-80. 3 figs.  
 1929c. On some false scorpions of the suborder Heterosphyronida. Can. Ent. 61:152-5.  
 1930. A synoptic classification of the false scorpions or chela-spinners, with a report on a cosmopolitan collection of the same.—Part II. The Diplosphyronida. Ann. Mag. Nat. Hist., Ser. 10, 5:1-48; 585-620. 3 figs.  
 1931a. The arachnid order Chelonethida. Stanford Univ. Pubs., Univ. Ser., Biol. Sci. 7:1-284. 71 figs.  
 1931b. *Parachernes ronnaii*, a new genus and species of false scorpion from Brazil (Arachnida—Chelonethida) Ent. News 42:192-5. 1 pl.  
 1932. A synoptic revision of the generic classification of the chelonethid family Cheliferidae Simon (Arachnida). Can. Ent. 63:289-94; 64:17-21, 35-9. (Volume 63 dated 1931.)  
 1934. On two species of false scorpions collected by birds in Montana, with notes on the genus *Dinocheirus*. Pan-Pacific Ent. 10:125-32. 1 pl.  
 1938. New and little-known false-scorpions from the Pacific and elsewhere. Ann. Mag. Hist., Ser. 11, 2:259-85. 6 figs.

### Chamberlin, J. C., and R. V. Chamberlin

1945. The genera and species of the Tridenchthoniidae (Dithidae). Utah Univ. Bul. 35(23):1-67. 17 figs.

### Ellingsen, Edv.

1909. Die Pseudoskorpione des Berliner Museums. Zoologisches Museum in Berlin Mitteilungen 4:357-423.

Essig, E. O.

1929. Insects of western North America. Macmillan Company, N. Y. 1035 pp. 766 figs.

Ewing, H. E.

1911. Notes on pseudoscorpions; a study on the variations of our common species, *Chelifer cancroides*. Linn., with systematic notes on other species. N. Y. Ent. Soc. Jour. 19:65-81. 15 figs.

Feio, Jose Lacerda de Araujo

1941. Sobre um curioso pseudoscorpião. Papéis avulsos do Departamento de Zoologia 1:241-4. 1 fig. São Paulo.

Fourcroy, Antoine François

1785. Entomologia parisiensis. 2 vols., 554 pp. Paris.

Geoffroy, E. L.

1762. Histoire abrégée des insectes qui se trouvent aux environs de Paris. 2 vols.: 28 + 523 pp., 10 pls.; 690 pp., 12 pls. Paris.

Gervais, François Louis Paul

1849. In Gay Historia física y política de Chile (Zoologica) 4:13. Paris.

Hadzi, Jovan

1933a. Primos poznavanju pseudoskopijske faune Primorja. Prirodoslovna istraživanja Kraljevine Jugoslavije 18:125-92. Zagreb.

1933b. Beitrag zur Kenntnis der Pseudoskorpionen—Fauna des Küstenlandes. Académie Yougoslave, Classe des sciences mathématiques et naturelles Bulletin International 27:173-99. Zagreb.

Hagen, Hermann

1869. The American Pseudo-scorpions. Record of American Entomology for the Year 1868: 48-52. Salem.

1879. Höhlen-Chelifer in Nord-America. Zoologischer Anzeiger 2:399-400. Leipzig.

Hermann, J. F.

1804. Mémoire aptérologique. 144 pp., 9 col. pls. Strasbourg.

Hoff, C. Clayton

1944a. Notes on three pseudoscorpions from Illinois. Ill. State Acad. Sci. Trans. 37:123-8. 2 figs.

1944b. New pseudoscorpions of the subfamily Lamprochernetinae. Am. Mus. Nat. Hist. Novitates 1271:1-12. 15 figs.

1945a. New species and records of pseudoscorpions from Arkansas. Am. Micros. Soc. Trans. 64:34-57. 2 pls. 21 figs.

1945b. New species and records of cheliferid pseudoscorpions. Am. Midland Nat. 34:511-22. 12 figs.

1945c. Pseudoscorpions from North Carolina. Am. Micros. Soc. Trans. 64:311-27. 12 figs.

1945d. *Hesperochnes canadensis*, a new chernetid pseudoscorpion from Canada. Am. Mus. Nat. Hist. Novitates 1273:1-4. 7 figs.

1945e. The pseudoscorpion genus *Albiorix* Chamberlin. Am. Mus. Nat. Hist. Novitates 1277:1-12. 20 figs.

1946a. A redescription of two of Hagen's pseudoscorpion species. New Eng. Zool. Club. Proc. 23:99-107. 6 text figs. Pl. I with 10 figs.

1946b. Additional notes on pseudoscorpions from Illinois. Ill. State Acad. Sci. Trans. 38: 103-10.

1946c. New pseudoscorpions, chiefly neotropical, of the suborder Monosphyronida. Am. Mus. Nat. Hist. Novitates 1318:1-32. 32 figs.

1946d. The pseudoscorpion tribe Cheliferini. Chicago Acad. Sci. Bul. 7:485-90.

1946e. American species of the pseudoscorpion genus *Microbisium* Chamberlin, 1930. Chicago Acad. Sci. Bul. 7:493-97.

1946f. A study of the type collections of some pseudoscorpions originally described by Nathan Banks. Wash. Acad. Sci. Jour. 36(6):195-205. 8 figs.

1947. The species of the pseudoscorpion genus *Chelanops* described by Banks. Harvard Univ. Mus. Compar. Zool. Bul. 98:473-550. 37 figs.

Kew, H. W.

1912. On the pairing of pseudoscorpiones. Zool. Soc. London Proc. 376-90.

Koch, C. L.

1843. Die Arachniden 10:37-80. Pls. 337-347. Nürnberg.

Linnaeus, Carolus

1758. Systema naturae, tenth edition 1. 2 + 824 pp. Helmsiae.

Preyasler, J. D. E.

1790. Verzeichniss böhmischer Insecten. 108 pp., 2 col. pls. Prague.

Roswer, C. Fr.

1936- Chelonethi oder Pseudoscorpione. In Bronn, H. G., Die Klassen und Ordnungen  
1937. des Tierreichs 5:div. 4, book 6, no. 2, 1-320. Leipzig.

Ross, Herbert H.

1944. How to collect and preserve insects. Ill. Nat. Hist. Surv. Circ. 39:1-55. 63 figs.

Say, Thomas

1821. An account of the Arachnides of the United States. Acad. Nat. Sci. Phila. Jour.  
2:59-82.

Simon, Eugène

1879. Chernetes. Les Arachnides de France 7:1-78. Paris.

Stecker, Anton

1875. Ueber zweifelhafte Chernetiden-Arten, welche von A. Menge beschrieben wurden.  
Deutsche (Berliner) Entomologische Zeitschrift 19:305-14.

Tömösváry, Ö.

1882. Pseudoscorpiones Faunae Hungariae. Matematikai és természettudományi Közle-  
mények 18:135-256. Budapest.

Vachon, Max

1940. Remarques sur la phorésie des pseudoscorpiones. Société entomologique de France  
Annales 109:1-18. Paris.

1941a. *Chthonius tetrachelatus* P. et ses formes immatures (1<sup>re</sup> note). Muséum national  
d'histoire naturelle Bul. 13:442-9. 23 figs. Paris.

1941b. *Chthonius tetrachelatus* P. et ses formes immatures (2<sup>e</sup> note). Muséum national  
d'histoire naturelle Bul. 13:540-7. 6 figs. Paris.

1947. Nouvelles remarques a propos de la phorésie des pseudoscorpiones. Muséum national  
d'histoire naturelle Bul. 19:84-7. Paris.

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